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UNITED STATES DEPARTMENT OF AGRICULTURE
BULLETIN No. 1074

Washington, D. C. Issued November 8, 1922; revised August, 1923

CLASSIFICATION OF AMERICAN WHEAT VARIETIES

By

J. ALLEN CLARK, Agronomist in Charge, JOHN H. MARTIN, Agronomist, Western Wheat Investigations, and CARLETON R. BALL, Cerealist in Charge, Office of Cereal Investigations, Bureau of Plant Industry

CONTENTS

	Page
Necessity for a Classification of Wheat	1
Previous Investigations	2
Foreign Classifications	3
American Classifications	7
Summary of Previous Classifications	9
Present Investigations	10
Classification Nurseries	11
Preparing Descriptions, Histories, and Distributions	15
Varietal Nomenclature	17
The Wheat Plant	22
Morphological Characters	23
Physiological Characters	47
Classification of the Genus Triticum	48
Key to the Species or Subspecies	50
Common Wheat	50
Club Wheat	172
Poulard Wheat	180
Durum Wheat	183
Emmer	193
Spelt	195
Polish Wheat	197
Einkorn	198
Unidentified Varieties	199
Estimated Acreage of Varieties	207
Literature Cited	219
Index to Varieties and Synonyms	231

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CONTENTS.

Page.
Necessity for a classification of wheat — 1
Previous investigations — 2
  Foreign classifications — 3
  American classifications — 7
  Summary of previous classifications — 9
Present investigations — 10
  Classification nurseries — 11
  Preparing descriptions, histories, and distributions — 15
  Varietal nomenclature — 17
The wheat plant — 22
  Morphological characters — 23
  Physiological characters — 47
Classification of the genus Triticum — 48
  Key to the species or subspecies — 50
  Common wheat — 50
  Club wheat — 172
  Poulard wheat — 180
  Durum wheat — 183
  Emmer — 193
  Spelt — 195
  Polish wheat — 197
  Einkorn — 198
  Unidentified varieties — 199
Estimated acreage of varieties — 207
Literature cited — 219
Index to varieties and synonyms — 231

NECESSITY FOR A CLASSIFICATION OF WHEAT.

The varieties of wheat grown in the United States show a great diversity of type. This diversity is natural, as wheat is produced commercially in all of the 48 States of the Union, under a wide range of environmental conditions. More than 200 distinct varieties are grown. Many of these are adapted only locally, while others are well adapted to a wide range of varying conditions. This adaptation of a variety is an important factor, as it affects the yield and profitableness of the crop. The choice of varieties for given conditions and purposes, therefore, usually is given careful consideration by growers. The choice, however, is dependent upon the determination of identity.

The identification of varieties requires some knowledge of the appearance of plant and kernel and is assisted by information regarding its history or distribution. Wheat varieties are most generally designated by names, which are established through publication and usage. The association of a name with a recognized type of wheat enables identification. Confusion in names is frequent, especially in America, where the number of actual varieties is very large. This confusion occurs in two principal ways: (1) The same name is applied to very different varieties in different parts of the country, and (2) the same variety is grown under several different names in different parts of the country or even in the same part. Identification is difficult in cases of similar or closely related varieties and is confused by the multiplicity of names.

There is need, therefore, for a practical and usable system of classification which will standardize the varietal nomenclature and enable growers to identify varieties with which they are concerned. The purpose of this bulletin is to provide such a classification of the wheat varieties that are grown commercially in the United States or may be grown soon. The classification has been made by using only such characters as can be distinguished by the naked eye, no instrument other than a measuring rule having been used in the investigations. The names of varieties have been standardized in accordance with a code of nomenclature prepared by Ball and Clark (*43*)[1] and adopted with slight changes by the American Society of Agronomy.

This bulletin is written in response to a demand for varietal information from farmers, agronomists, plant breeders, and members of the grain trade. It should form the basis for future work in wheat improvement, save the time and expense of breeding for combinations of characters which are already in existence, prevent much duplication of work in conducting varietal experiments, and aid in preventing the fraudulent or unknown exploitation of old varieties of wheat under new names. Its greatest value, however, should be in providing a compendium of the wheats of North America for all workers in the wheat industry, especially those who have only a limited or local knowledge of the varieties which are grown.

PREVIOUS INVESTIGATIONS.

Most of the systematic study of wheat varieties has been done by foreign investigators. Comparatively little work of this nature has heretofore been done in America.

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[1] The numbers (italic) in parentheses refer to "Literature cited," at the end of this bulletin.

FOREIGN CLASSIFICATIONS.*

The existence of many different varieties of wheat has been recognized for more than 2,300 years. Theophrastus (*189*), a pupil of Plato, in his "Enquiry into Plants," written about 300 B. C., states:

> There are many kinds of wheat which take their names simply from the places where they grow, as Libyan, Pontic, Thracian, Assyrian, Egyptian, Sicilian. They show differences in color, size, form, and individual character, and also as regards their capacities in general and especially their value as food.

Theophrastus mentioned many of the differences between these kinds of wheat. In the writings of Varro, Pliny, and Columella, in the first century B. C. and the first century A. D., the observations of Theophrastus were repeated, rearranged, and amplified. Columella, who wrote about 55 A. D. (*74*, trans. 1745), presents these previous observations and his own, as follows:

> *Triticum*, common bare wheat which has little husk upon it, was, according to Varro, a name given formerly to all sorts of grain beaten or bruised out of ears by trituration or thrashing; but afterwards it was given to a peculiar species of grain, of which there are many sorts, which take their name from the places where they grow; as African, Pontic, Assyrian, Thracian, Egyptian, Silician, etc., which differ from one another in color, bigness, and other properties too tedious to relate. One sort has its ears without beards and is either of winter or summer. Another sort is armed with long beards and grows up sometimes with one, sometimes with more ears. Of these the grains are of different sorts; some of them are white, some reddish, some round, others oblong, some large, others small. Some sorts are early ripe, others late in ripening; some yield a great increase, some are hungry and yield little; some put forth a great ear, others a small. One sort stays long in the hose; another frees itself very soon out of it. Some have a small stalk or straw; others have a thick one as the African. Some are clothed with few coats, some with many, as the Thracian. Some grains put forth only one stalk, some many stalks. Some require more, some less time to bring them to maturity. For which reason some are called *trimestrian*, some *bimestrian;* and they say that in Euboea there is a sort which may be brought to perfection in 40 days; but most of these sorts which ripen in a short time are light, unfruitful, and yield very little, though they are sweet and agreeable to the taste and of easy digestion.

In the early Roman literature mentioned reference is found to two groups of wheat, namely, *triticum* and *adoreum*, or *far*. Columella referred to the *far* as bearded wheat. The grain of *triticum* was separated from the chaff in thrashing, while that of the *far* was not, indicating that the former consisted of true wheats, while the latter was emmer or spelt.

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* NOTE.—Since this manuscript was completed, two excellent publications on wheat classification have appeared:

(a) Australia. Institute of science and industry. A classification and detailed description of some of the wheats of Australia. Australia. Inst. Sci. and Indus., Bul. 18, 48 p., 4 pl. (1 col.). 1920. Forty-eight of the leading wheats of Australia are classified and described in a manner similar to that used by the writers.

(b) Percival, John. The Wheat Plant. x, 463 p., 228 fig. (in text and on pl.). (1921.) Bibliography, p. 441–453. A large number of wheat varieties of the world are described and classified and the morphology of the wheat plant discussed fully.

In addition to the publications reviewed here, extensive botanical treatises on the taxonomy of wheat forms have been published in Russia by Flacksberger, the most important one being Flacksberger, C., Determination of wheats. *In* Bul. Appl. Bot., v. 8, no. 1/2, p. 9–210 (1–202), 43 fig., 1 col. pl., 1915. In Russian. English summary, p. 183–210 (175–202).

Columella himself recognized three types of Triticum, *robus* (red), *siligo* (white), and *trimestrian* (spring), and in addition four types of bearded wheat (spelt or emmer), viz:

> *Clusinian*, of a shining, bright, white colour; a bearded wheat, which is called *venunculum*. One sort of it is of a fiery-red colour and another sort of it is white; the *trimestrian* seed, or that of 3 months' growth, which is called *halicastrum*.

It is evident from these quotations that many of the leading characters of the wheat plant were recognized in this early period. What attention was given to studies of wheat during the Dark Ages no one can say. With the revival of learning the botanists and medical men began the publication of the folio and royal octavo herbals, many of them illustrated with woodcuts. In these, wheat species were included, the forms mostly being those described by Theophrastus, Pliny, and Varro, but from time to time new ones were added. There is little advantage in trying to guess what particular form of common wheat each so-called species represented. More recent botanical writers described species which can now be recognized. Principal among these writers was Tournefort (*194*), who in 1719 listed 14 species of Triticum.

The classification of wheat practically began with the work of Linné in 1753. In his Species Plantarum (*140*) he described seven species of Triticum, viz: *T. aestivum*, *T. hybernum*, *T. turgidum*, *T. spelta*, *T. monococcum*, *T. repens*, and *T. caninum*. The two latter species have since been included in another genus. In the second edition of the Species Plantarum, published in 1764, he describes six species which are still included in the genus Triticum, viz: *T. aestivum*, *T. hybernum*, *T. turgidum*, *T. polonicum*, *T. spelta*, and *T. monococcum*, the species *T. polonicum* having been added. Linnæus divided the common wheat, *T. vulgare*, into two species, *T. aestivum*, awned spring, and *T. hybernum*, awnless winter, apparently believing that all spring wheats were awned and all winter wheats awnless. Writers who followed him usually have not recognized these distinctions.

Lamarck, in 1786 (*134*), created the species *Triticum sativum* to include both the species *T. aestivum* and *T. hybernum* which Linnæus had adopted. Each species and subspecies was described according to the presence or absence of awns, the color and covering of the glumes, the color, size, and density of the kernels, the solidity of the stem, and several other characters.

Villars, in 1787 (*198*), divided the common wheats into two species, *Triticum vulgare* and *T. touzelle.* The latter consisted of awnless wheat having white kernels.

Desfontaines, in 1800 (*79*), established the species *Triticum durum* for the group of wheats having long awns and long vitreous kernels.

Host, in 1805 (*119*), described and named the species *Triticum compactum* to include the club wheats and in addition recognized 10 other species of the genus *Triticum.*

Seringe, in 1819 (*174*), arranged the common and club wheats together into 10 groups based on lax or dense and awned or awnless spikes, white or brownish kernels, and glabrous or pubescent glumes. He listed varieties from Switzerland, France, Germany, and England.

Metzger, in 1824 (*143*), at Heidelberg, followed essentially the same system as Seringe, but in addition considered winter or spring habit of growth. The 10 groups of Seringe were further subdivided, making 18 groups. The kernels were described as white, yellow, and reddish.

Metzger, in 1841 (*144*), reedited his classification of 1824, making some changes and adding more varieties.

Seringe, in 1841 (*175*), published a revision of his previous work of 1818, in which he classified and partly described a large number of varieties of wheat.

Alefeld, in 1866 (*35*), classified the wheats into two genera and species, *Triticum vulgare* and *Deina polonica.* The latter contained four subspecies or varieties of Polish wheats, *T. polonicum*, while the former was divided into many subspecies and varietal groups containing all other species of Triticum. Each of these was described in detail.

Heuzé, in 1872 (*111*), grouped the wheats into 7 species. He listed 700 varietal names of wheat, 602 of which belonged to the species *Triticum sativum*, which included both common and club wheats. He described 47 varieties in this species, while the remaining 555 names were considered as synonyms.

Koernicke, in 1873 (*132*), and Koernicke and Werner, in 1885 (*133*), prepared the most complete classification of wheat yet published. They followed Alefeld's system of applying Latin names to the botanical groups. The groups keyed by them included 22 of *vulgare*, 21 of *compactum*, 26 of *turgidum*, 24 of *durum*, 12 of *spelta*, 20 of *dicoccum*, 21 of *polonicum*, and 4 of *monococcum.* Named varieties included in each botanical group were described in detail, and the history, synonyms, and source of each were given. Much of this latter information had been published in the works of Alefeld and Heuzé.

Harz, in 1885 (*104*), classified and described a large number of wheats in a manner similar to that of Koernicke and Werner. The common and club wheats were considered as a single species.

Hackel, in 1887 (*101*), classified the genus *Triticum* according to a key very similar to the one adopted by Koernicke and Werner. Hackel recognized three species, *sativum* Lam., *monococcum* L., and *polonicum* L.; and three races of *sativum*, namely, *spelta*, *dicoccum*, and *tenax*. In the latter he included *vulgare*, *compactum*, *turgidum*, and *durum* as subraces.

Vilmorin, in 1889 (*199*), grouped the wheats into 50 sections, according to their leading characters. Each section was briefly described and the synonyms were given. The common and club wheats were considered as one species.

Eriksson, in 1895 (*88*), subdivided the botanical groups of Koernicke and Werner into smaller groups which he called subvarieties, based chiefly on the density of the spike, the thickness of the kernel, and the length of the rachis. He also gives an excellent review of the literature on wheat classification.

Heuzé, in 1896 (*112*), published a second edition of his "Les Plantes Céréales," in which were included rather complete histories and descriptions of the varieties of wheat.

Cobb, in 1896 (*69*), keyed 54 varieties of wheat which he was growing in New South Wales, Australia, using the leading plant, spike, and kernel characters. In 1905 (*72*) he proposed to classify wheat varieties by a microscopic examination of the aleurone layer. This method, however, is impracticable for classification purposes in the field, or even with certainty in the laboratory, when closely related varieties are considered.

Howard and Howard, in 1909 (*121*), classified the wheats of India largely according to the methods of Koernicke and Werner and of Eriksson. They (*120*) also consider in detail the characters used in classification.

Richardson, in 1913 (*158*), described many of the wheats of Australia and gave the history of each variety. He did not arrange them in a classified order.

The Union of South Africa in 1919 (*181*) published descriptions and synonyms of the wheat varieties of South Africa which also designated the areas where the varieties should be grown in that country.

Ducellier, in 1920 (*82*), published a classification and descriptions of the wheats of the Hoggar and oasis regions of Algeria. Only a few varieties were fully described.

AMERICAN CLASSIFICATIONS.

Harmon, in 1844 (*103*), published descriptions and histories of about 30 varieties of wheat which he had grown in Monroe County, N. Y.

Klippart, in 1858 (*131*), described a large number of wheat varieties grown in Ohio and grouped them into a partly classified order.

Todd, in 1868 (*193*), described a number of wheat varieties, most of the descriptions, however, being obtained from agricultural literature of the time. He suggested that the Government "take hold of this subject [the nomenclature of wheat] in a proper manner and establish a common standard of merit and an intelligible description of each variety . . ."

Killebrew, in 1877 (*130*), described a number of American wheats, most of which had been described previously by Klippart or Todd. He grouped the varieties into two families, winter wheats and spring wheats. The winter wheats were divided into six classes based upon their kernel characters, white, amber, and red, and upon the awned or awnless character. The spring wheats, which were all regarded as being awned, were placed in three classes, with white, amber, or red kernels.

Tracy, in 1881 (*195*), listed a number of wheat varieties grown by him at the Missouri Agricultural Experiment Station. The varieties were partly described, showing the "bearded" or "smooth" heads and the color and size of the kernels. He mentions several varietal names as being synonymous.

Devol, in 1887 (*80*) and in 1888 (*81*), published a classification of the wheat varieties being grown at the Ohio Agricultural Experiment Station. This classification was further developed by Hickman (*113*), who in 1889 divided the varieties into eight morphological groups.

Plumb, in 1889 (*153*), described a large number of wheat varieties, chiefly American, and gave the histories of many of them.

Blount, in 1892 (*47*), listed 478 varieties of wheat which he was growing experimentally in New Mexico. Histories of some of these were given.

Carleton, in 1900 (*58*), summarized the varietal information of that time, listed about 350 varieties, gave their source by countries and their principal characters, and grouped them by districts of the United States to which they are best adapted.

Scofield, in 1902 (*172*), classified and described a large number of durum wheats grown in Algeria, many of which were introduced into the United States about 1901. He also described the characters used in classification. In 1903 Scofield (*173*) prepared a detailed list of characters to be used in the description of wheat varieties. He did not publish the descriptions of any varieties at that time. The application of the terminology was partly illustrated by plates accompanying the article.

Williams, in 1905 (*204*), listed and partly described about 60 varieties of wheat which were under experiment at the Ohio Agricultural Experiment Station at that time.

Hume, Center, and Hegnauer, in 1908 (*122*), briefly classified the wheat varieties grown in experiments in Illinois, and gave the history and partial descriptions of some of the Russian and American varieties.

Scherffius and Woosley, in 1908 (*171*), published illustrations of 36 varieties of wheat grown by the Kentucky Agricultural Experiment Station.

Noll, in 1913 (*149*), presented a tabular description of varieties grown by the Pennsylvania Agricultural Experiment Station.

Leighty, in 1914 (*138*), gave a list of the leading varieties of wheat grown in the eastern half of the United States, arranging them in classified groups by kernel and spike characters.

Schafer and Gaines, in 1915 (*170*), recorded brief descriptions of the principal wheat varieties of Washington, together with their histories.

Nelson and Osborn, in 1915 (*148*), gave a brief tabular description of the wheat varieties grown at the Arkansas Agricultural Experiment Station during the period from 1908 to 1914.

Reisner,[2] in 1915, compiled much valuable information on the description and history of New York varieties.

Ball and Clark, in 1915 (*39*), presented keys to the groups of hard red spring wheat and the durum wheats grown in the United States and described and gave the histories of the more important varieties.

Carleton, in 1916 (*61*), listed the leading wheat varieties of the world, including American varieties. They were grouped into the botanical groups used by Koernicke and Werner. No attempt was made to distinguish between the closely related agricultural varieties.

Stanton, in 1916 (*185*), grouped a large collection of wheat varieties grown in experiments in Maryland and Virginia, in accordance with some of the most obvious taxonomic characters.

Jones, in 1916 (*129*), presented a brief key to the groups of common spring and durum wheats grown in experiments in Wyoming.

Ball and Clark, in 1918 (*42*), published a key to the groups and varieties of durum wheat grown in the United States.

Grantham, in 1918 (*99*), listed a large number of varieties which were being grown at the Delaware Agricultural Experiment Station and stated whether they were bearded or smooth, and also the color of the grain and chaff, the height of the plant, and the weight of the kernels.

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[2] Reisner, John H. Wheat in New York. 1915. Unpublished thesis, Cornell University. The writers wish to here acknowledge the use of this manuscript, credit being due to both the author and the Farm-Crops Department of Cornell University.

Clark, Stephens, and Florell, in 1920 (*67*), gave a tabular description of over 150 samples of Australian wheat varieties grown in experiments in the Pacific coast area of the United States.

Clark, Martin, and Smith, in 1920 (*66*), keyed the groups of common spring and durum wheat grown in experiments in the northern Great Plains area of the United States, and gave the histories of the principal varieties.

Stewart, in 1920 (*187*), presented keys and brief descriptions of the commercial wheat varieties grown in Utah.

SUMMARY OF PREVIOUS CLASSIFICATIONS.

From the beginning of botanical classification there was a tendency to regard the different forms of wheat as distinct species. Toward the end of the eighteenth century there became evident a tendency toward the more reasonable view that comparatively few species were involved and that the evident major groups were mostly to be regarded as subdivisions of the species *sativum* of Lamarck or *vulgare* of Villars.

The making of botanic species of wheat was carried to great lengths by the botanists of 100 to 200 years ago, who did not recognize that the characters sufficient to separate species of wild plants were sufficient to separate only agronomic and horticultural varieties of domesticated plants. Before this fact was recognized and botanists very largely had ceased to deal with the forms of cultivated plants, some 50 or 60 supposed species of wheat had been described.

In the works of most of the botanists there was little effort to study and describe the farm varieties of wheat. However, Heuzé, Koernicke and Werner, Eriksson, Richardson, and others described many varieties, and some of their descriptions were fairly complete. No attempt has been made, however, previous to the present work, to show by detailed keys and by uniform descriptions the minor differences which separate closely related varieties.

There has been wide diversity among botanists in the taxonomic use of the various morphological characters of the wheat plant and seed. Only a few authors have given attention to the winter or spring habit of growth in wheat varieties. Some, as Eriksson, have placed undue importance on differences in spike density. Many writers have made no use of the colors of the seed coat in separating varieties.

The classification of Koernicke and Werner is the most extensive and the only one which made a definite attempt to describe and classify foreign and domestic farm varieties. While conservative to the extent of reduction of the number of species, these authors still maintained a complete Latin nomenclature for forms as far as the fifth rank. In their discussions, these authors, as well as other investigators named, were handicapped through making their studies in only one locality. In the present work, the varietal descriptions are based on the expression of each variety under the widely varying conditions of environment found in different parts of the United States.

PRESENT INVESTIGATIONS.

The present investigations were started in 1915[3] with the object of making a classification of the wheats of the world. During the first two years much time was devoted to a study of foreign varieties, and several hundred introductions were added to the large collection of foreign wheats previously obtained. In the third year the study was devoted largely to diverse botanical types obtained from hybrids or distinct types found as mixtures in wheat fields in the western United States. It was soon determined, however, that if the studies were to be of economic value, they must be limited to the principal cultivated varieties. The World War prevented the completion of the introduction of foreign wheats, so it was finally decided to limit the present publication to the commercial American varieties. In the spring of 1919, a "Preliminary classification of American wheat varieties,"[4] containing a key to varieties and index, was prepared in mimeograph form, and about 100 copies distributed to agronomic workers. Suggestions and corrections were invited. Several changes which were suggested have been incorporated.

Hundreds of foreign and domestic varieties have been grown, studied, described, and classified, and herbarium specimens have been preserved in a classified order. Many of these varieties, however, are not included in this bulletin. During the past three years the commercial varieties have been given the most careful study. Many varieties not previously known were obtained and grown. Each year the varieties studied during the preceding season, with all new material obtained, were grown in the classified order presented herein. Each year, therefore, the classification became more definite and complete. There still remains much to be learned about the American varieties, but it is thought that publication of the information compiled to date should no longer be delayed.

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[3] The plan to classify wheat varieties was evolved by Carleton R. Ball, agronomist in charge of Western Wheat Investigations, in the summer of 1914, while studying a large number of foreign and domestic varieties in breeding nurseries at experiment stations in the western United States. In July of that year J. Allen Clark became his assistant, and the classification was carried on jointly until April, 1918, when Mr. Ball was promoted to the position of cerealist in charge. Since that time the classification has been continued by Mr. Clark, who was placed in charge of Western Wheat Investigations, and by John H. Martin, who became his assistant in February, 1919.

During the entire investigation the fullest cooperation has been received from Dr. C. E. Leighty, agronomist in charge of Eastern Wheat Investigations, who has furnished numerous varieties, much information on varietal history and synonymy, and some assistance with the nurseries in the Eastern States.

In the preparation of the manuscript of this classification C. W. Warburton has rendered valuable editorial assistance. The drawings were made by Mrs. R. E. Gamble and the photographs, unless otherwise indicated, were taken by E. L. Crandall. These services are all gratefully acknowledged.

[4] Clark, J. Allen, Ball, Carleton R., et al. Preliminary classification of American wheat varieties, 20 p. 1919. (U. S. Dept. Agr., Off. Cereal Invest. Mimeographed circ.)

CLASSIFICATION NURSERIES.

Classification nurseries have been grown in several widely separated sections of the United States. This was necessary in order to determine the expression of varieties under different environments and thus embrace a scheme of classification which would be workable wherever the varieties happened to be grown. It also guarded against the loss of certain types, which often results if wheat is grown at only one place. In Table 1 is shown the location of 18 experiment stations where classification nurseries have been sown, as well as the annual and total number of sowings which were made.

TABLE 1.—*Annual and total number of rows sown in the classification nurseries of fall and spring wheat at one or more of 18 experiment stations in the United States during the 6-year period from 1915 to 1920, inclusive.*

Station.	1915		1916		1917		1918		1919		1920		6-year total, fall and spring.
	Fall.	Spring.	Fall.	Spring.	Fall.	Spring.	Fall.	Spring.	Fall.	Spring.	Fall.	Spring.	
Chico, Calif.	146		790		902		950		720	720	1,419		5,647
Corvallis, Oreg.							944	1,091	495	495	480	480	3,985
Moro, Oreg.		152	691	313	1,804	554	950	1,091	495		235	480	6,765
Pullman, Wash.									186		126	109	421
Aberdeen, Idaho		164	307	313									784
Nephi, Utah			430										430
Bozeman, Mont.											126		126
Moccasin, Mont.		680		619									1,299
Akron, Colo.			302										302
Fort Collins, Colo.											126		126
Williston, N. Dak.						554							554
Dickinson, N. Dak.		787											787
Newell, S. Dak.				619									619
St. Paul, Minn.		657											657
Manhattan, Kans.			534										534
Amarillo, Tex.		550											550
Arlington Farm, Va.					736		523				235		1,494
Ithaca, N. Y.					301								301
Total	146	2,990	3,054	1,864	3,743	1,108	3,367	2,182	1,896	1,215	2,747	1,069	25,381

Table 1 shows that during the six years 1915 to 1920 more than 25,000 separate sowings were made. Most of these were made at experiment stations in the western United States. The greatest number of sowings at any one station, totaling 6,765, was made at the Sherman County branch station at Moro, Oreg.; the second greatest, 5,647, at the Plant-Introduction Garden, Chico, Calif.; and the third greatest, 3,985, at the Oregon Agricultural Experiment Station, Corvallis, Oreg. At these western points growing conditions were much better for classification purposes than at eastern points. The absence of summer rains in the Western States is the principal reason for this, as plant characters and colors are more distinctly developed. At Chico, Calif., and Corvallis, Oreg., there was the added advantage of being able to sow both winter and spring wheats in the fall without danger of losing the spring forms. At Moro, Oreg., spring wheats sometimes survived from fall sowing also. At the latter point much valuable information was obtained from spring sowing of wheats having a winter habit. These studies were found to be necessary to determine accurately the true plant habit of some varieties.

The classification nurseries were sown in short rows, usually not exceeding 5 feet in length and a foot or 18 inches apart. At the stations where all varieties were sown both in fall and spring, each variety was sown in the spring on one end of the row sown in the fall. Plate I shows portions of the classification nursery at Corvallis, Oreg., in 1919. Figure A of Plate I shows spring wheat fall sown and spring sown, the fall-sown portion being on the right and the spring-sown portion on the left. Figure B of the same plate shows winter wheat spring sown and fall sown in the same manner.

ASSISTANCE RECEIVED.

To obtain samples of the different wheat varieties was the first important task. This was accomplished with the assistance of many individuals and institutions.[5]

The classification nurseries at the various stations usually were sown by local representatives.[6] The local men also took notes on

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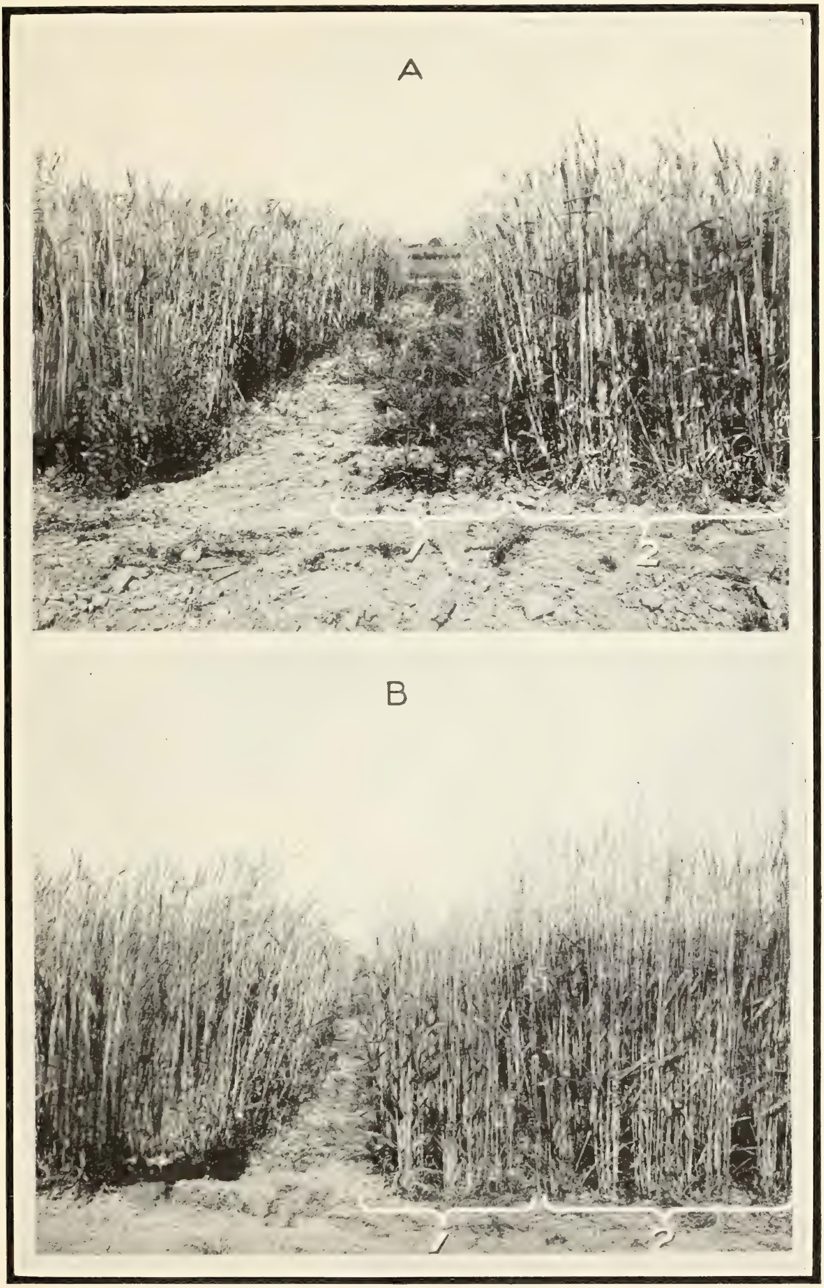
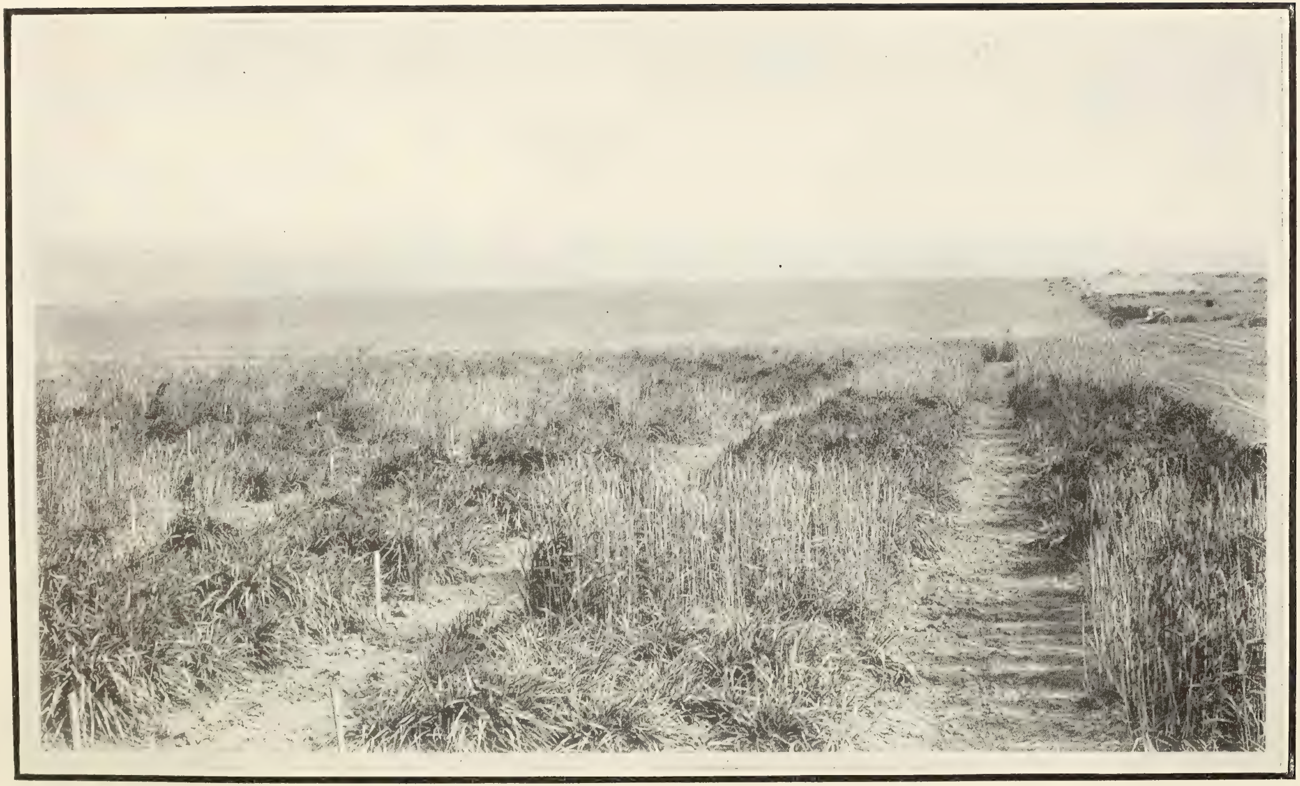
[5] The writers have obtained samples of seed and cooperation in other ways from officers of the divisions of grain standardization and grain supervision, Bureau of Markets, of the U. S. Department of Agriculture. Samples also have been obtained from most of the State agricultural experiment stations in the United States and the Dominion Department of Agriculture in Canada, and the writers wish here to express thanks to the officers of these many institutions who have so kindly assisted in this work.

[6] The writers wish to acknowledge gratefully the cooperation of field men of the Office of Cereal Investigations. To Mr. D. E. Stephens, superintendent of the Sherman County branch station, at Moro, Oreg., and to Mr. V. H. Florell, assistant agronomist, in charge of the cereal investigations at the Plant-Introduction Garden, Chico, Calif., special credit is due and is here gladly given. Other station men who have assisted in these studies are Mr. F. J. Schneiderhan, formerly scientific assistant, in charge of the cereal-breeding nursery at Moro, Oreg.; Mr. L. C. Aicher, superintendent of the Aberdeen substation, Aberdeen, Idaho; Mr. J. W. Jones, formerly superintendent of the Nephi substation, Nephi, Utah; Mr. N. C. Donaldson, formerly scientific assistant, in charge of the cereal experiments at the Judith Basin substation, Moccasin, Mont.; Mr. George A. McMurdo, formerly assistant, in charge of the cereal investigations at the Akron Field Station, Akron, Colo.; Mr. F. R. Babcock, formerly scientific assistant, in charge of the cereal studies at the Williston substation, Williston, N. Dak.; Mr. Ralph W. Smith, assistant agronomist, in charge of the cereal experiments at the Dickinson substation, Dickinson, N. Dak.; Mr. J. H. Parker, formerly scientific assistant, in charge of the breeding for rust resistance in cereals at the University Farm, St. Paul, Minn.; Mr. Louis Wermilskerchen,



WHEAT-CLASSIFICATION NURSERY AT CORVALLIS, OREG., IN 1919.

A, Varieties of winter wheat grown from spring (1) and fall (2) sowing. *B*, Varieties of spring wheat grown from spring (1) and fall (2) sowing. (Photographs by J. A. Clark.)



WHEAT-CLASSIFICATION NURSERY GROWN AT MORO, OREG., IN 1918.

The winter habit of winter-wheat plants from spring sowing is here shown. (Photographed by D. E. Stephens.)

emergence, heading, ripening, and height of the many varieties. During the summer the writers visited the various points and took detailed notes on the characters of the varieties. It was here, in the field, that the descriptions of the varieties were written and the keys designed and perfected to distinguish the different varieties. The descriptions were checked and rechecked at the various points and the different descriptive classes were established on a basis broad enough to include the varieties wherever they were grown.

NATURE OF THE MATERIAL.

The early studies showed the necessity of working with pure lines. When bulk seed was used it often consisted of mixed varieties and a wrong description might easily become applied to a variety. For that reason careful notes were made on the material that was sown in each nursery. A typewritten outline was prepared each year which showed the classified arrangement of the varieties based on the results to date and also the row numbers at each station. The same variety often was represented by different lots of seed obtained from different sources. These were distinguished by different C. I. numbers, which are accession numbers of the Office of Cereal Investigations. The varieties, however, have always been distinguished by names rather than by numbers. For this reason Cereal Investigations numbers are not used in this publication. The nursery outlines also contained columns showing the source of the seed sown and the original source of the variety. In addition, they showed whether the seed sown was bulk grain or a pure line, and if a pure line, whether the same pure line was sown at all stations or whether different pure lines were used. In this way it was easily possible to compare field notes accurately with those of the previous year or to account for differences which existed in the same variety at different stations in the same year. This latter condition often occurred when bulk grain or different pure lines were used. Natural field hybrids thus were easily distinguished from mixtures.

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formerly scientific assistant, in charge of the cereal nursery at the Amarillo Cereal Field Station, Amarillo, Tex.; Mr. A. D. Ellison, formerly scientific assistant, Mr. H. P. Ames, formerly agent, and Mr. J. W. Taylor, scientific assistant, respectively, in charge of the cereal investigations at the Arlington Experimental Farm, near Rosslyn, Va.; Dr. H. H. Love, professor of plant breeding, and Mr. W. T. Craig, agent, Cornell University, Ithaca, N. Y.

The writers also acknowledge with gratitude the assistance received from the following officers of the State experiment stations not formally cooperating with the Office of Cereal Investigations: Prof. G. R. Hyslop, professor of farm crops, and Prof. C. C. Ruth, assistant professor of farm crops, at the Oregon Agricultural Experiment Station, Corvallis, Oreg.; Prof. E. F. Gaines, assistant professor of farm crops at the Washington Agricultural Experiment Station, Pullman, Wash.; Prof. P. V. Cardon, agronomist at the Montana Agricultural Experiment Station, Bozeman, Mont.; Mr. Breeze Boyack, formerly assistant agronomist at the Colorado Agricultural Experiment Station, Fort Collins, Colo.; and Prof. S. C. Salmon, professor of farm crops at the Kansas Agricultural Experiment Station, Manhattan, Kans.

After growing, for a couple of years, several pure-line strains of the same variety obtained from several sources, one of the strains was selected as the standard for the variety. The descriptions here recorded, therefore, should represent the true type of the variety. In certain cases, however, material was limited to samples obtained from only one or two sources, and in these cases the judgment of the writers in selecting the pure strain which correctly represents the variety may not be as accurate as where more samples of the same variety were available.

Many varieties here described are badly mixed in commercial fields wherever they are grown. Mention of this sometimes is made in the descriptions. In many cases this will account for differences observed between a variety and its description, as here recorded. In other cases all the characters which are here recorded may not become apparent in some localities, and this may cause some confusion. The failure of stem and glume colors to develop in some sections is an example of this.

Natural crossing between wheat plants occurs quite commonly in the western United States. In the classification nurseries several hybrid rows have been found each year. These had been sown from material which was apparently pure the previous season and which was grown from a single head. In some instances the hybrids were not noticed until the second generation when they were segregating. This natural crossing has caused some difficulty in describing varieties, especially because hybridization between closely related varieties could not always be detected.

Several hundred mixtures obtained from experimental plats and commercial fields were grown in the classification nurseries for identification. A few proved to be mechanical mixtures of varieties grown in the locality, but most of these were new types. These probably originated, for the most part, from natural hybrids, with possibly an occasional mutation. Many of the types continued to segregate, thus proving their hybrid origin. Those which came true to type were either mutations or the homozygous progeny of hybrids. As the progeny of a cross nearly all tend to become homozygous after being grown several years, it is believed that practically all of the new types can be accounted for in this way. Many of the new types closely resembled American or foreign varieties, but were not identical in all characters.

Practically every field of wheat contains some plants which can not be identified with any known variety. These are easily found, because of their differences from the remainder of the plants in the field. Many of these forms, in all probability natural hybrids or mutations, have been submitted to the writers for identification, but as a rule this is not possible. Considering the opportunities for the natural and artificial production of new forms, the number of distinct varieties of wheat existing in the United States is not surprising. It is really remarkable to find so comparatively few in commercial cultivation. By making all possible combinations of the characters used by the writers in describing the wheat varieties, several thousand new varieties could be produced.

PREPARING DESCRIPTIONS, HISTORIES, AND DISTRIBUTIONS.

For each variety there is given the description, the history so far as known, the distribution in the United States, and the synonymy.

PREPARATION OF VARIETAL DESCRIPTIONS.

Detailed descriptions have been written of the wheat varieties here enumerated. These descriptions contain much more detailed information concerning the nature of the varieties than is included in the keys and are necessary for a clear knowledge of the appearance of the varieties. The descriptions are not complete, however, several of the morphological characters of the wheat plant not being included because they are of little or no value in classification. Only the more important taxonomic characters are used. This has made possible shorter and more concise descriptions than would otherwise be possible. However, they are thought to be sufficiently inclusive to provide a comprehensive knowledge of the different varieties.

Following the descriptions of many varieties is a paragraph showing the chief characters which distinguish the variety from closely related ones. This gives the reader a more ready comparison of certain varieties than is otherwise possible.

PREPARATION OF VARIETAL HISTORIES.

The history of the origin of varieties can not be neglected in a complete classification, as many varieties are scarcely or not at all distinguishable from similar or closely related varieties and differ only in their origin or qualities. In this study much attention has been given to the history of varieties, and to many readers it probably will be the most interesting and valuable part of the classification. The compiling of these histories has been a long and arduous task. It has required a review of the literature on wheat varieties written during a period of more than 200 years. The sources of this information are varied. Definite information is readily available on the origin of only a comparatively few varieties. Introductions of foreign varieties have been recorded in recent years by the Office of Foreign Seed and Plant Introduction. Frequent reference is made to the accession numbers and published inventories of that office. Many bulletins of the State agricultural experiment stations have contained valuable information on the origin of domestic varieties. Agricultural papers have been reviewed, and much information as to the origin of varieties has been obtained from that source. There is still much to learn concerning the origin of our cultivated varieties. The origin of many probably has never been recorded, but of some for which the origin has not been determined there probably is a recorded history somewhere. Reference is always given to the published sources of the histories that have been obtained.

DETERMINATION OF DISTRIBUTION OF VARIETIES.

The commercial distribution and production of different varieties are the greatest economic factors with which this classification is concerned. Those varieties which are most widely grown usually are the most valuable. Varieties that are more productive may be in existence, but until they become known and widely grown they are of little value. New varieties are being continually produced. Some are of little or no value. Others are an improvement over the older standard varieties, as their use extends the area of wheat culture, increases the yield per acre, or improves the quality. This adds to production and increases the income of the producer.

The commercial success of varieties is largely dependent upon their adaptation to the conditions in which they are grown. A variety that produces well in a locality soon becomes well known and its acreage increases until it comes into competition with other varieties which are more productive. The production of old, well-adapted varieties is rather extensive and stable. Their distribution has become fixed within certain general sections. New varieties are still competing for supremacy and therefore are more locally and sparingly grown. Poorly adapted varieties sometimes have continued in cultivation for more than a century in isolated and unimportant wheat-producing localities. The distribution of these, therefore, is often widely scattered.

THE VARIETAL SURVEY.

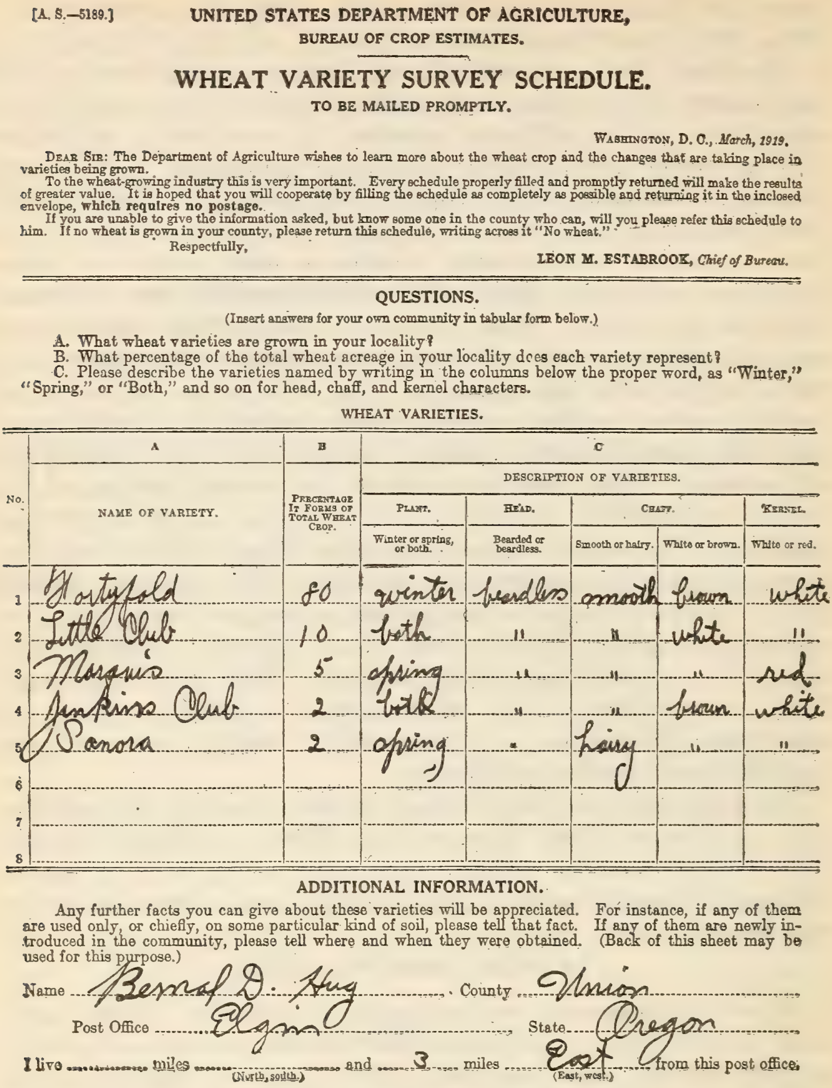
To determine the commercially cultivated varieties of wheat in the United States and the extent of their distribution, a wheat varietal survey was made in cooperation with the Bureau of Crop Estimates. The first survey was made in 1917, when questionnaires were sent to one or two correspondents in each of the wheat-producing counties of the various States. The incomplete returns from this survey were very interesting and contained so much valuable information from the counties reporting that it was decided in 1918 to send questionnaires to several correspondents in all counties not previously reporting, in order to have a more complete record. The replies were received and tabulated. They showed the varieties grown in the localities of the county where the correspondents lived, but it was soon determined that all of the varieties grown in the county were not included and that one or two reports from each county did not give an accurate estimate of the proportionate distribution of the different varieties. It was finally decided in 1919 to determine rather accurately the percentage each variety formed of the total wheat crop of each county. A new schedule was printed for this survey and about 70,000 were mailed. To the more important wheat-growing counties as many as 30 to 40 questionnaires were sent, fewer being sent to counties less important in wheat production. From the survey about 40,000 returns were received. About 19,000 of these gave definite information, and these results have been tabulated. In addition to the names of varieties grown and the percentage each formed of the total wheat crop, the questionnaires contained tabular spaces for descriptions of varieties. From these descriptions the correct naming of the variety was checked. Figure 1 shows a copy of one of the returned schedules. The reports were edited before being tabulated and thus many recognizable mistakes were corrected. The summary of these reports revealed a large number of new names used for old varieties and also brought to light several wheats distinctly different from any of the varieties previously obtained. More than a thousand letters were written to the correspondents, requesting samples and additional information. A considerable number of additional varieties were obtained in this way.

The distribution of the different varieties shown in this publication was obtained from these surveys. The maps which illustrate the distribution of the varieties were made on the basis of one dot for every thousand acres or less in each county where the variety was grown in 1919.

VARIETAL NOMENCLATURE.

Wheat varieties must be distinguished by names. These names must be used frequently by agronomic workers, as well as by a host of crop growers and crop users. The form and appropriateness of these names, therefore, are of general interest. It is desirable that they be short, simple, and appropriate, easily spelled and pronounced. It also is desirable that, as far as possible, a single name be accepted and used for each recognized variety.

The multiplication of names and other designations for crop varieties has already been carried to great extremes. The resulting confusion is very great, especially in wheat, where the number of actual varieties is very large. In addition to the confusion of names, many names are objectionable. Many varietal designations are merely descriptive phrases which are often long and cumber-



[A. S.—5189.]

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF CROP ESTIMATES.

WHEAT VARIETY SURVEY SCHEDULE.
TO BE MAILED PROMPTLY.

WASHINGTON, D. C., *March, 1919.*

DEAR SIR: The Department of Agriculture wishes to learn more about the wheat crop and the changes that are taking place in varieties being grown.

To the wheat-growing industry this is very important. Every schedule properly filled and promptly returned will make the results of greater value. It is hoped that you will cooperate by filling the schedule as completely as possible and returning it in the inclosed envelope, **which requires no postage.**

If you are unable to give the information asked, but know some one in the county who can, will you please refer this schedule to him. If no wheat is grown in your county, please return this schedule, writing across it "No wheat."

Respectfully,

LEON M. ESTABROOK, *Chief of Bureau.*

QUESTIONS.

(Insert answers for your own community in tabular form below.)

A. What wheat varieties are grown in your locality?
B. What percentage of the total wheat acreage in your locality does each variety represent?
C. Please describe the varieties named by writing in the columns below the proper word, as "Winter," "Spring," or "Both," and so on for head, chaff, and kernel characters.

WHEAT VARIETIES.

No.	A	B	C				
			DESCRIPTION OF VARIETIES.				
	NAME OF VARIETY.	PERCENTAGE IT FORMS OF TOTAL WHEAT CROP.	PLANT.	HEAD.	CHAFF.		KERNEL.
			Winter or spring, or both.	Bearded or beardless.	Smooth or hairy.	White or brown.	White or red.
1	Fortyfold	80	winter	beardless	smooth	brown	white
2	Little Club	10	both	"	"	white	"
3	Marquis	5	spring	"	"	"	red
4	Jenkins Club	2	both	"	"	brown	white
5	Sonora	2	spring	"	hairy	"	"
6							
7							
8							

ADDITIONAL INFORMATION.

Any further facts you can give about these varieties will be appreciated. For instance, if any of them are used only, or chiefly, on some particular kind of soil, please tell that fact. If any of them are newly introduced in the community, please tell where and when they were obtained. (Back of this sheet may be used for this purpose.)

Name Bernard D. Hug, County Union
Post Office Elgin, State Oregon
I live .... miles .... (North, south.) and 3 miles East (East, west.) from this post office.

FIG. 1.—A returned questionnaire of the wheat varietal survey.

some. Others are only numbers, which sometimes are equally long and cumbersome or are easily confused. Because of this condition, a code of nomenclature was proposed by Ball and Clark (*43*), so that in this classification varietal names could be selected in accordance with its rules. The code was presented to the American Society of Agronomy at its annual business meeting on November 13, 1917. After a few minor changes were made by the committee on varietal nomenclature, it was adopted by the society (*37*) as follows:

CODE OF NOMENCLATURE.

1. ELIGIBILITY TO NAMING.—No variety shall be named unless (*a*) distinctly different from existing varieties in one or more recognizable characters, or (*b*) distinctly superior to them in some character or qualities, and (*c*) unless it is to be placed in commercial culture.

2. PRIORITY.—No two varieties of the same crop plant shall bear the same name. The name published (see par. 4) for a variety shall be the accepted and recognized name except in cases where it has been applied in violation of this code.

   A. The term "crop plant," as used herein, shall be understood to mean those general classes of crops which are grouped together in common usage without regard to their exact botanical relationship, as corn, wheat, sorghum, cotton, potato, etc.

   B. The paramount right of the originator, discoverer, or introducer of a new variety to name it, within the limitations of this code, shall be recognized.

   C. Where the same varietal name has become thoroughly established for two or more varieties, through long usage in agronomic literature, it should not be displaced or radically modified for either one, except where a well-known synonym can be substituted. Otherwise the varieties bearing the same name should be distinguished by adding some suitable term which will insure their identity.

   D. Where several well-established names are used for the same variety the list of synonyms shall be submitted to some committee of the American Society of Agronomy. This committee shall choose the name which it deems most suitable, observing the established Code of Nomenclature.

   E. Existing American varietal names which conflict with earlier published foreign names for the same or different varieties but which have been thoroughly established through long usage shall not be displaced unless long-used and available synonyms exist.

   F. It is recognized that certain strains of varieties may occur which do not differ from a standard variety in recognizable characters, but may differ in yield, adaptation, or quality and are entitled to recognition by a distinct name. Such strain shall be given a new name, but the name of the type variety in parentheses should follow.

3. FORM OF NAMES.—The name of a variety shall consist of a single word, except where it conflicts with rule 2, C or E.

   A. Varietal names shall be short, simple, distinctive, and easily spelled and pronounced.

   B. A varietal name derived from a personal or geographical name should be spelled and pronounced in accordance with the rules governing in the case of the original name.

   C. The name borne by an imported foreign variety should be retained, subject only to such a modification as is necessary to conform it to this code.

   D. The name of a person should not be used as a varietal name during his lifetime. The name of a deceased person should not be so used except by the official action of this or other competent agronomic bodies. Personal names in the possessive form are inadmissible.

   E. Names of stations, States, or countries, in either the nounal or adjective form, should not be used as varietal names, except in unusual cases where the name is well established.

3. FORM OF NAMES—Continued.

F. Such general terms as hybrid, selection, seedling, etc., should not be used as varietal names.

G. A number, either alone or attached to a word, should not be used as a varietal name, but considered as a temporary designation while the variety is undergoing preliminary testing.

H. Names which palpably exaggerate the merits of a variety shall be inadmissible.

I. In applying the provisions of this rule to varietal names which have become firmly established in agronomic literature through long usage, no change shall be made which will involve loss of identity.

4. PUBLICATION.—A varietal name is established by publication. Publication consists (1) in the distribution of a printed description of the variety named, giving its distinguishing characters; or (2) in the publication of a new name for a variety properly described elsewhere, such publication to be made in any book, bulletin, circular, report, trade catalogue, or periodical, provided the same bears the date of issue and is distributed generally among agronomists and crop growers; or (3) in certain cases the general recognition of the name for a commercial variety in a community for a number of years may be held to constitute publication.

A. Where two or more admissible names are given to the same variety, in the same publication, that which stands first shall have precedence.

5. REGISTRATION.—After a classification is made, and names assigned according to the code, and the same has been officially adopted by this society, no new names shall be recognized by the society except by registration. Registration shall consist in the introducer submitting to the secretary of the American Society of Agronomy, or some properly authorized committee a sample of seed, together with a full statement and evidence setting forth reasons why the variety is entitled to a new name. The society (or committee) shall then have sufficient time in which to grow the crop in trial grounds and thoroughly examine the claims before reporting on the new name.

6. CITATION.—In the full and formal citation of a varietal name, the name of the author who first published it shall be given when the same can be determined.

7. REVISION.—No properly published varietal name shall be changed for any reason except conflict with this code, nor shall another variety be substituted for that originally described thereunder.

NEW VARIETIES NAMED.

Since the adoption of this code names have been given to several new American varieties. They are Ashland, Forward, Honor, Kota, Laramie, Minhardi, Minturki, Norka, and Ruddy.

VARIETAL NAMES CHANGED.

Some changes in the nomenclature of wheat varieties already have been made, in accordance with the rules of the code. Principal among these are Preston for Velvet Chaff, Converse for one Red Russian, and Ladoga for Spring Turkey. In this bulletin the following changes are made: Satisfaction for Smith Rust Proof, Prosperity for American Bronze, Alton for Ghirka Winter, Dixon for

Humpback II, Emerald for Early Spring, Pentad for D–5, and Vernal for White Spring emmer. Of these, the first two are selections of existing synonyms that have been long used. The third and fourth are new names adopted because of the confusion existing in American literature between the varieties formerly called Ghirka Winter and Ghirka Spring and between Humpback and Humpback II, or Smooth Humpback. The fifth and seventh are new names selected for varieties formerly known only under the designation of a descriptive adjective, and the sixth is a name selected for a variety formerly known only by a letter and number combined.

The revision of varietal names is undertaken in this classification. The code provides that, if desirable, revision should be done, but without losing the identity of the name to the variety. Revision is absolutely necessary in some cases in order to avoid duplication of names and confusion and in other cases is desirable to simplify and standardize the nomenclature. These are important objects of the classification. Some revisions have already been made and the identity of the varietal name retained. Examples of this are Turkey for Turkey Red and Peliss for Pelissier.

The following simplifications of the names of wheat varieties are made in this classification. The rules of the code have been followed in all instances. In some cases the simplified name is not as satisfactory as might be desired, but undoubtedly it is an improvement. Several undesirable names of recognized varieties have not been revised, because it does not appear practicable at the present time, as they have about gone out of cultivation or are of little commercial importance.

List of simplified names used in this classification.

New name.	Original name.
Martin	Martin Amber.
Challenge	Webb's Challenge White.
Dart	Dart's Imperial.
Surprise	Pringle's Surprise.
Lynn	Lynn Rust Proof.
Pilcraw	Pilcraw Enormous.
Leap	Leap's Prolific.
Oakley	Extra Early Oakley.
Wyandotte	Wyandotte Red.
Purplestraw	Purple Straw.
Wellman	Wellman's Fife.
Ghirka	Ghirka Spring.
Climax	Jones Climax.
Dawson	Dawson Golden Chaff.
Arcadian	Early Arcadian.
Goldcoin	Gold Coin.
Allen	Red Allen.
Peterson	Lars Peterson.
Rupert	Rupert's Giant.
Currell	Currell's Prolific.
Red Clawson	Early Red Clawson.
Rochester	Rochester Red.
Red Chief	Early Red Chief.
Schlanstedt	Rimpau's Red Schlanstedter Sommerweizen.

List of simplified names used in this classification—Continued.

New name.	Original name.
Resaca	Red Resaca.
Silvercoin	Silver Coin.
Jones Fife	Jones Winter Fife.
Grandprize	St. Louis Grand Prize.
Mammoth Amber	Jones Mammoth Amber.
Palisade	White Palisade.
Baart	Early Baart.
Sibley	Sibley New Golden.
Champlain	Pringle's Champlain.
Java	Early Java.
Hussar	Red Hussar.
Blackhull	Clark's Black Hulled.
Gluten	Gluten B 86.
Silversheaf	Jones Silver Sheaf Longberry Red.
Link	Missing Link.
Genesee Giant	Early Genesee Giant.
Read	Read's Vermont Winter.
Longberry No. 1	Jones Longberry No. 1.
Penquite	Penquite's Velvet Chaff.
Jenkin	Jenkin's Club.
Redchaff	Red Chaff Club.
Wilbur	Early Wilbur.
Bluechaff	Blue Chaff Calvert Club.
Dale	Dale Gloria.
Clackamas	Clackamas Wonder.

SYNONYMY OF VARIETIES.

Many varieties are known by several names. The names here used for the recognized varieties are the original names or the name now most commonly used or are the new or simplified names, as provided for by the code of nomenclature. All other names used for the varieties here described are considered synonyms.

THE WHEAT PLANT.

The different cultivated varieties of wheat vary greatly in their habit, form, and structure, but all are annual grasses. The principal parts are the roots, culms, leaves, and spikes. There are two sets of roots, the first or seminal or seed roots and the second or coronal roots, the latter arising from the crown of the stem. The culm is a hollow, jointed cylinder comprising three to six nodes and internodes. The upper internode of the culm, which bears the spike, is called the peduncle. The leaves are composed of the sheath, blade, ligule, and auricle. The spike is made up of the rachis and spikelets, the latter in turn comprising the rachillas, glumes, lemmas, paleas, and the sexual organs, or the three stamens, and the single ovary with its style and stigma. Each of these parts may show distinct characters in different varieties. Those characters that do not vary or are not readily observed are of little value in classification. The root characters, for example, which are not apparent, can not be conveniently used, and no attention has been given to them in this work. Other characters, such as those of the sheaths, ligules, and auricles, are not generally used because they show very slight differences in different varieties.

The keys and descriptions which are used here to distinguish and identify varieties are based on characters which show considerable variation and therefore are of value.

MORPHOLOGICAL CHARACTERS.

The following pages present in detail such morphological characters of the wheat plant as have been found in the present study to be of the most taxonomic value. The characters used to distinguish the different species, subspecies, and lesser groups in the genus Triticum are often of no higher rank than the characters used to distinguish the cultivated varieties.

In the preparation of the key certain primary characters have been used in a regular sequence. These characters are designated as major characters, and in the key they are printed in capitals. Certain other characters are used in the key to separate further the closely related varieties. For this purpose any character is used which serves to distinguish the varieties under discussion. The same characters may not be used in two successive cases and they are not used in any definite order. These secondary characters are printed in ordinary type and are designated as minor characters. The general principle followed in the choice of characters in the key was to progress from those most easily observed and most often occurring to those least easily observed or least often occurring. The principle governing the sequence of characters in the key is to progress from the absence of the character, as awnlessness, to the presence of the character and from the smaller size to the greater.

The descriptions of the wheat varieties are arranged in a logical order of plant development. The major and minor characters used in the key are included in their proper places in the descriptions, as are many minor characters not used in the keys.

All of the taxonomic characters which are used in the keys and descriptions of cultivated varieties are considered below in the order of their appearance in the descriptions.

PLANT CHARACTERS.

Certain plant factors which are genetically different in the several varieties are of value for classification purposes. These are the habit of growth, the period of growth, and the height of the plant.

HABIT OF GROWTH.

All wheat varieties are here classified as having winter habit or spring habit of growth. These characters are shown in Plate II. In the keys to the cultivated varieties they occupy the seventh and last major position. Varro (in Columella, *74*) writing before the beginning of the Christian era called the spring wheats *trimestrian*, because they matured in three months from sowing. Linné (*140*) treated them as separate species in his Species Plantarum, but combined the awned factor with the spring habit in his species *aestivum* and the winter habit with the awnless factor in his species *hybernum*. Few writers have since recognized these species, but the placing of both spring and winter forms of common wheat in one species, *Triticum vulgare*, by Villars in 1787 (*198*) has been almost universally accepted. The existence of winter and spring forms has been recognized by most authors but has not recently been used as a character for separating species or even as an important character for separating varieties. The writers consider these distinctions to be of less value for classification purposes than several spike and kernel characters, when the whole country is considered, although it is a very important separation in some areas. In the southern United States, both in the east and west, several varieties of spring wheat are fall sown, and growers do not know whether they have a spring wheat or a fall wheat. The Purplestraw variety of the Southeastern States has a true spring habit, although it has been grown from fall sowing in that section for more than 100 years. Nearly all of the varieties grown in Arizona and California are spring wheats, but are fall sown.

Hunt (*123*, p. 54) and others have pointed out that winter and spring wheats can be changed from one form to the other. These are factors which limit the value of the characters in classification. To use the winter and spring habit as the first separating characters also would widely separate otherwise very closely related varieties and in practice would result in a double classification.

The winter and spring habits are shown as the first characters in the descriptions, as those characters are the first apparent in the growth of the plant. In the key the wheats having a winter habit are listed before those having a spring habit, because there are more fall wheats than spring wheats and because fall wheat is of much greater importance in this country than spring wheat.

A few varieties of winter wheat are somewhat intermediate or facultative in their habit of growth. This is mentioned in the descriptions of such varieties, but in the key only the two classes are recognized. The intermediate types retain their prostrate habit of growth for only a short time or else they are semierect instead of prostrate. Early varieties of winter wheat have a short prostrate or dormant period, and when spring sown they begin heading only a few weeks after the spring wheats have headed, thus giving an appearance of intermediate habit at the later stages of growth. There are also certain varieties of wheat which are not homozygous as to winter or spring habit. The habit of growth is determined by sowing the wheat in the spring and observing its behavior. A winter wheat is one which usually produces no seed when sown at the normal date of seeding for spring wheat. All varieties classed as winter wheats in the key can be successfully produced only from fall sowing. When spring sown they usually remain prostrate on the ground throughout the growing season and produce no culms or spikes. In some sections, or in some years, or when sown very early, winter-wheat varieties when spring sown will head and produce seed, but this usually occurs very late in the season.

All varieties of wheat classified as spring wheats can be successfully grown from fall sowing only in mild climates, such as the southern parts of the United States and along the Pacific coast. In parts of this territory they will sometimes winterkill. When spring sown their early growth is erect and culms and spikes are produced during the early part of the growing season.

TIME OF MATURITY.

The time between emergence and maturity is often an important economic factor in wheat production. The duration of the growing period is indicated by classing varieties as early or midseason or late. These are considered secondary characters, but nevertheless are important economically and also in classification. Winter wheats and spring wheats require periods for growth which can not be directly compared in number of days. Fall-sown spring wheats may mature as late as or later than many of the true winter wheats. The above separation, however, into three classes can be used for both fall and spring wheats, or for all wheats when sown in the fall. No definite unit of time is used, therefore, in defining these separations. It is simply a relative measurement to be used in comparing varieties with those of which the normal time of maturity is known. Spring varieties grown in the northern Great Plains area would be classified as early when maturing in 85 to 95 days after emergence, as midseason when maturing in 90 to 100 days, and as late when maturing in 95 to 105 days. These variations are so small and such differences between the varieties are apparent during so short a period that these factors are of minor value in classification and are used only to separate closely related varieties.

TILLERING.

The tillering or stooling of wheat also is of little taxonomic value in separating varieties. Koernicke and Werner (*133*) recorded the number of plants and culms obtained from definite quantities of seed.

Grantham (*98*) showed that tillering is a varietal characteristic to a limited extent. He also showed that—

> Since the number of tillers a wheat plant produces is dependent upon so many environmental conditions a number of observations must be made in order to establish in which degree this tendency is exhibited. For this reason it is difficult to classify varieties closely as to their tillering habit.

The degree of tillering, therefore, is of little value for classification purposes and is not used in the descriptions. A few varieties, such as Turkey, usually have a large number of culms per plant, while durum varieties have comparatively few.

HEIGHT OF THE PLANT.

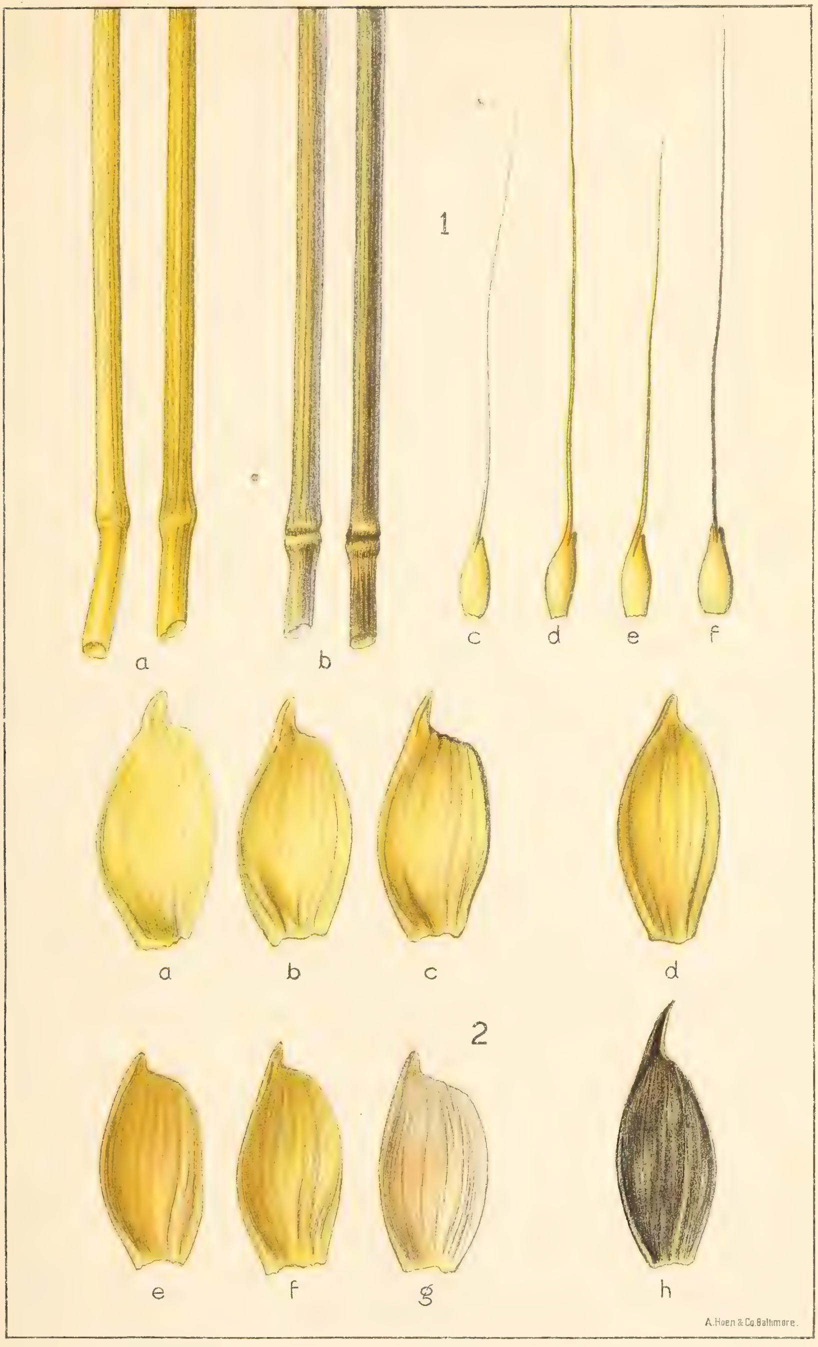
The height of the plant also is often an important economic factor in wheat production, because it may determine the method or ease of harvesting. Height is measured from the surface of the ground to the tip of the spike, not including the awns of awned varieties. In regard to height, all varieties of wheat have been placed in the three classes—short, midtall, and tall. These are characters of minor value for classification and are used only for separating or distinguishing otherwise closely related varieties. The principles governing the grouping of varieties as early, midseason, and late apply here also. As an example, under California conditions wheats from 12 to 36 inches in height would be classed as short; wheats from 24 to 48 inches in height would be called midtall, and wheats from 36 to 60 inches high would be considered tall. In most other sections of the country these differences would not be as great. In order to use the height of the plant as a character, the height of certain varieties must be determined and used for comparison.

STEM CHARACTERS.

There are three characters in the stem of wheat varieties which are useful in classification, namely, height, color, and strength. Height already has been considered as a plant character.

COLOR OF THE STEM.

All varieties of wheat are here classified as having white or purple stems. The colors of the stem and the variations that exist are shown in Plate III, Figure 1, *a* and *b*. These characters are of minor importance in classification, for in many localities and in some seasons the purple color common to a large number of wheat varieties does not become apparent. This often is the case under conditions of extreme drought and also under conditions of excessive moisture. Under favorable conditions, however, this stem color is very apparent during a week or 10 days in the ripening period. When apparent, the color differences are very useful in distinguishing varieties. The



WHEAT STEMS AND GLUMES.

FIG. 1.—Portions of wheat stems showing color, (*a*) white, (*b*) purple; and awns showing colors, (*c*) white, (*d*) yellowish, (*e*) brown, (*f*) black. FIG. 2.—Glumes of wheat varieties showing the colors, (*a*) and (*b*) different shades of white, (*c*) white with black-striped margins, (*d*) yellowish, (*e*) and (*f*) different shades of brown, (*g*) bluish brown, (*h*) black. (Enlarged 3 diameters.)

color is usually most apparent on the peduncle, or uppermost internode supporting the spikes, but often continues downward to the sheaths of the lower leaves.

Those varieties here described as having white stems may have a stem color ranging from a cream to a golden yellow. Few, if any, have stems which are truly white or with an absence of color.

The varieties classed as having purple stems may have a stem ranging in color from a pale violet to a dark purple. In some varieties this coloring may occur only in a short portion of the peduncle. It sometimes does not occur in the peduncle and is present only in the sheaths. As previously stated, under some conditions it may not appear at all in a variety where it normally is present. The exact cause and nature of this coloring have not been worked out by the writers. It is probable that different quantities of moisture, heat, and light influence the color development. Koernicke and Werner used color differences in describing many of the varieties with which they worked. Heuzé (*112*, p. 54) pointed out the two contrasting characters, which he called white and reddish. Color always has been considered of minor importance in classification, however.

STRENGTH OF THE STEM.

The strength of the stem usually is an important economic factor. In many localities it is one of the most serious problems in wheat production, as many varieties are likely to lodge under conditions of excessive moisture. All varieties here discussed are classified into three groups, having weak, midstrong, or strong stems, respectively.

Stems classed as weak are also usually slender, with very thin walls. Varieties with such stems have a greater tendency to lodge, which in turn causes harvest losses and increases the cost of harvesting. The successful cultivation of weak-stemmed varieties usually is limited to semiarid or arid regions.

The varieties classed as having midstrong stems will not lodge under conditions favorable for wheat production. In this class are included the greater number of American varieties. A considerable variation exists within this group, and in humid sections varieties here described as having midstrong stems might more properly be classed as weak. In arid sections certain of these stems might more properly be classed as strong.

The varieties here described as having strong stems are those that will not lodge readily under excessively humid conditions. Only by a severe rain, hail, or wind storm can the stems of these varieties be bent or broken down. Comparatively few of the cultivated American wheats come in this class. Of these, the club wheats are of most importance.

LEAF CHARACTERS.

The principal parts of the leaves of wheat plants are the sheath, blade, ligule, and auricle. None of these parts usually show differences which are of even minor value for distinguishing cultivated varieties.

The blades of wheat varieties vary considerably in their dimensions, in the shade of green color, and in the angle to the culm maintained during the successive periods of plant growth. These differences, however, are apparent during only a short period. As the plant matures, the blades dry and frequently break off. Practically all cultivated varieties normally have three leaves, although this sometimes varies under unfavorable or very favorable conditions. In this bulletin very little use is made of leaf characters. A few varieties are noted as having especially broad or narrow blades or as being pubescent.

Koernicke and Werner (*133*) and others have described the color of the blades of both the seedlings and the partly grown plants. This also was attempted in the present studies, but the differences were found to be so slight and undependable that no definite classes could be established by using the character. No two persons can agree as to the various shades of green shown by the blades of wheat, even when a standard color chart is used. The color varies with the condition of the plant as affected by the temperature, the soil moisture, and the soil solution. The appearance of the color is changed by the character of the venation and of the blade surface. The plants appear to have a different color in the sunlight than in the shade, and the value changes also according to the position of the observer with regard to the direction of the rays of the sun. In general, the Crimean wheats have dark-green blades, while all durum varieties have blades with a light-green color.

The blade widths are mentioned in describing only a few varieties, because nearly all varieties are very much alike in this character. The Crimean wheats are distinctly narrow leaved, while varieties like Sol and Red Russian have wide leaf blades. In America the winter varieties having the narrowest blades usually are most winter hardy. The length of the blade has not shown sufficient constant differences for taxonomic purposes.

The terminal leaf of different varieties of wheat is sometimes quite erect and sometimes drooping at various angles. These differences are greatest just previous to the heading period, but frequently are not apparent a few days later. Chiefly because of the instability of this character, it is not used in this classification.

The sheaths normally inclose about the lower two-thirds of the culm, although in dry seasons the spike sometimes is not entirely exserted. The edges of the sheath overlap on the side opposite the blade. The sheaths may be either white or purple. During early growth they usually are quite scabrous, but become smoother at maturity. There are some differences in these characters in the cultivated varieties, but they are few and minute. After a careful study the writers decided not to include any sheath characters in the descriptions.

The same decision was reached in regard to the minute differences observed in the ligules and auricles. The ligules usually are short, varying from 1 to 2 mm. long, and becoming lacerate as the plant matures. Auricles always are present on wheat leaves. They are narrow to midwide, usually strongly curved, with a few long strigose hairs on the outer margin. The auricles often are purple in the young stage, sometimes changing to white as the plant matures.

SPIKE CHARACTERS.

The entire inflorescence on one culm is called the spike. It is made up of separate groups of flowers known as spikelets. These are borne singly on alternate sides of a zigzag, flattened, channeled, jointed rachis, parallel to its flat surface. At the base of each spikelet, on the apex of each rachis joint, a tuft of short hairs usually occurs. These hairs may be white or brown in color, but the differences are difficult to distinguish, partly because the hairs frequently are discolored.

Spikes differ greatly in form and degree of compactness. Club wheats (*Triticum sativum compactum*) have been separated from common wheats (*T. s. vulgare*) principally because of their distinctly compact or dense spikes.

In distinguishing the cultivated varieties, four spike characters are used. These are the awns, the shape, the density, and the erectness of the spikes.

AWNS.

All varieties of wheat are classed here as awnless or awned. Spikes of awnless and awned varieties, showing some of the variations that exist, are shown in Plate IV. The awns are important agriculturally and usually are the character most readily apparent. For these reasons this character has been given precedence over all others in preparing the keys. Some early writers, as previously stated, used this character for separating so-called species.

Awnless varieties may have short or intermediate or no apical awns, that is, awns near the apex of the spike. Whether the awns are wanting or present, the varieties classed as awnless can be distinguished easily from varieties that are awned throughout. Apical awns on varieties classed as awnless occur only on few to several of the uppermost spikelets, except in a few varieties, and seldom, if ever, exceed 5 cm. in length. From a genetic standpoint there probably are at least three distinct kinds of awnlessness. For the present classification, however, they are all classed as awnless, but in the descriptions the average extreme lengths of the apical awns are recorded.

Awned varieties are those that have an awn or beard which terminates the lemmas on all spikelets. These awns usually increase in length from the basal part of the spike upward. In the common wheats, awns seldom, if ever, exceed 10 cm. in length. In durum and poulard wheats, however, they usually range from 10 to 20 cm. in length.

SHAPE OF THE SPIKE.

Spikes differ greatly in shape, length, and width. They may be flattened parallel to or at right angles to the plane of the face of the spikelets. Those flattened parallel to this plane are widest when seen in face view and can be said to be dorsoventrally compressed. All varieties of common wheat have spikes thus formed, except those that are clubbed at the tip, in which case they are only partly so. Spikes that are flattened at right angles to the plane of the face of the spikelets are narrow when seen in face view and may be described as laterally compressed. The club, durum, and poulard wheats are separated from the common wheats partly on the basis of having such spikes.

In general, spikes vary in length from 5 to 15 cm., but are usually 8 to 12 cm. long. They vary in width or thickness from 1 to 3 cm. The differences in length and width are not used in themselves but are often combined with the spike shape in a compound descriptive word.

Whether dorsoventrally or laterally compressed, whether long or short, or narrow or wide, spikes are classified in the keys as having the following four general shapes—fusiform, oblong, clavate, and elliptical. These shapes are shown in Plate V. For all common wheats these shapes are determined from a face view of the spikelets and for all club, durum, and poulard wheats from an edge view of the spikelets.

Heuzé (*112*) used several different spike shapes as the leading characters in separating varieties within the species. The shapes mentioned, however, are here considered only as minor characters, though nevertheless very useful in distinguishing varieties.

Spikes classed as fusiform taper toward the apex or from the middle toward both base and apex. The larger number of varieties of common wheat have spikes of this shape.

Spikes described as oblong are usually quite uniform in width and thickness throughout the length of the spike, but are always several times longer than wide.

Varieties classed as having clavate spikes are clubbed, that is, distinctly larger and more dense at the apex. This is due to a shortening of the rachis internodes in that part of the spike, which results in a change from dorsoventral to lateral flattening and a broadening of the upper portion of the spike.

Elliptical spikes are short and quite uniformly rounded at both the base and apex, but are flattened on the sides. Most varieties of club wheat have spikes of this shape.

In the descriptions of varieties these designations of spike shapes have sometimes been modified to take into account the length and width of the spikes and the overlapping of shapes which occurs in some varieties.

Spikes that are unusually long are described as linear-fusiform, linear-clavate, etc. If spikes are unusually short that fact is included in the description. Broad spikes may be described as broadly fusiform or broadly oblong and narrow spikes as narrowly fusiform, etc.

Varieties that are nearly intermediate between any of the shapes are sometimes described as oblong-fusiform or oblong to subclavate. By the use of these compound descriptive terms spike shapes are more accurately presented in the description than they can be in the keys, where brevity is imperative.

DENSITY OF THE SPIKE.

The differences in shape of spikes shown above are due in part to differences in density. All spikes are described as of three density classes, viz, lax, middense, and dense. These differences are shown in Plate VI. These are minor differences which are used to advantage in distinguishing varieties. Seringe (*174*) separated the common wheats into two groups, having lax and dense spikes, respectively. Koernicke and Werner (*133*) described the spikes of many varieties according to different degrees of density. Neergaard (*147*) suggested a formula for use in measuring the density of the spike. Eriksson (*88*) subdivided the botanical groups of Koernicke and Werner on the basis of density into subvarieties called *laxum*, *densum*, and *capitatum*. He measured the density of spikes by determining the number of spikelets in 100 mm. of rachis length. Heuzé (*112*) used the spike density along with spike shape as the leading character in separating varieties. Boshnakian (*48*) described means of measuring density and suggested the name *Triticum compacto-capitatum* for varieties of club wheat having clavate heads.

Many measurements have been made by the writers to determine the difference in density of the spikes of the varieties here described. The most definite were found comparable at one station for one year, but otherwise were of little value. It was found necessary to establish density classes of rather indefinite limits. In this way allowance was made for the varying conditions. The density classes were finally fixed as lax, middense, and dense by determining the number of millimeters occupied by 10 internodes of the rachis measured in the center of the spikes. By this method spikes are classed as lax when 10 internodes occupy from 50 to 75 mm., as middense when 10 internodes occupy from 35 to 60 mm., and as dense when 10 internodes occupy from 20 to 45 mm. The greater number of varieties are included in the middense class, which, according to the above measurements, overlaps both the dense and lax classes by two-fifths of their entire range.

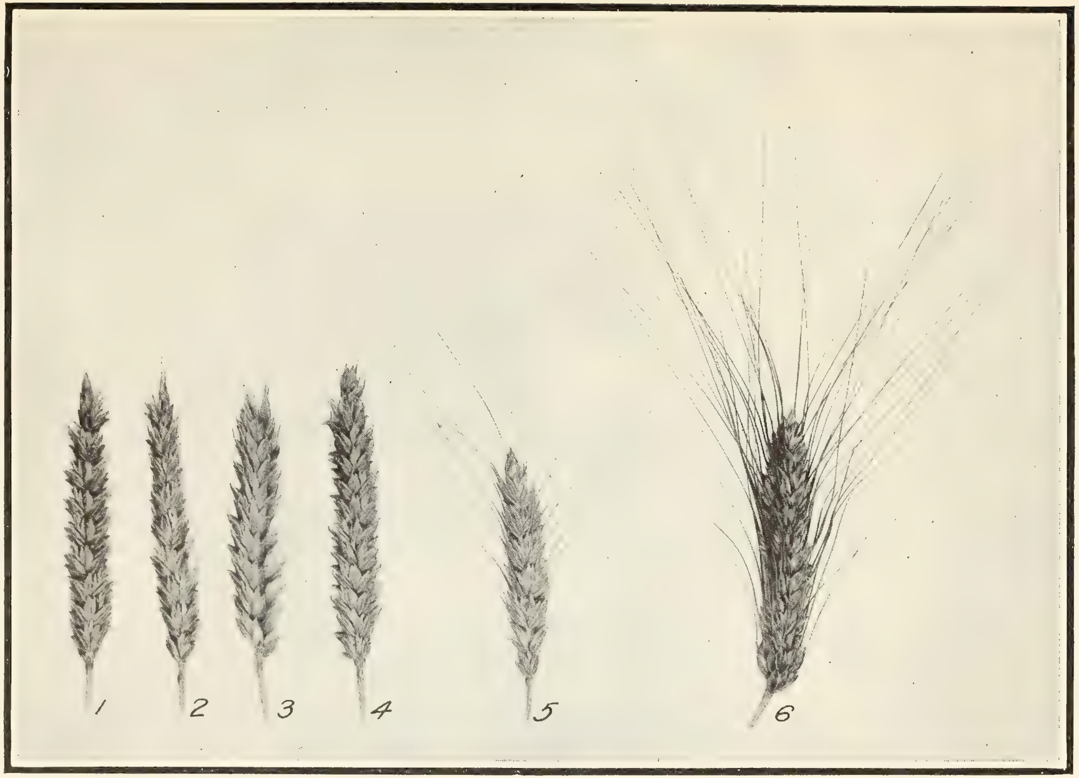
POSITION OF THE SPIKE.

The position of the spike at maturity is often distinctly different in different varieties. All spikes are here described as erect, inclined, or nodding. Heuzé (*112*) used essentially these same distinctions in describing his varieties.

Those varieties described as having erect spikes mature with the spike in an approximately vertical position. The spikes of these varieties seldom, if ever, are inclined more than 15 degrees from the vertical at maturity. Spikes of varieties which are described as inclined usually mature at an angle of approximately 15 to 45 degrees from the vertical, but sometimes are nearly erect, and under some conditions will become slightly nodding. The majority of wheat varieties come within this class. Varieties which are described as having nodding spikes usually mature with the spike in a drooping position, the apex of the spike being lower than the base. Spikes of such varieties sometimes are only inclined if they are not well filled with grain when ripe.

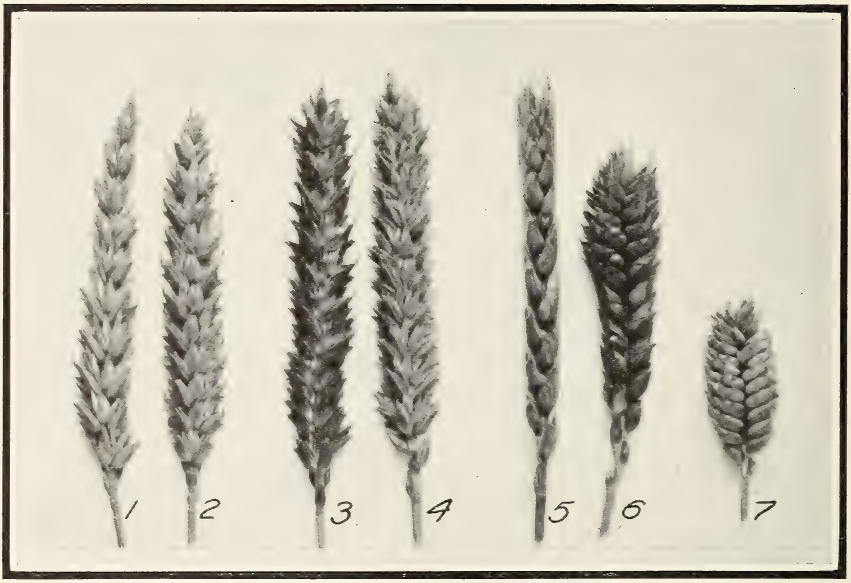
GLUME CHARACTERS.

The unit of the spike is the spikelet. It consists of several flowers or florets attached alternately to opposite sides of a central axis or rachilla. These flowers, three to five in number, are subtended by two empty scales, called the glumes, the keel of which terminates in a tooth or beak. Each floret consists of a flowering glume, called the lemma, and a thin 2-keeled glume called the palea. These two glumes inclose the sexual organs. The lemma incloses the back, dorsal, or outer portion, of the mature kernel and in the awned varieties terminates in an awn. The lemma itself is of little or no use in classification. The palea protects the inner or crease side of the kernel. It differs from the lemmas in having its back, instead of its face, toward the rachilla or axis of the spikelet. Like the lemmas, it is not used in distinguishing varieties. The glumes, however, are much used.



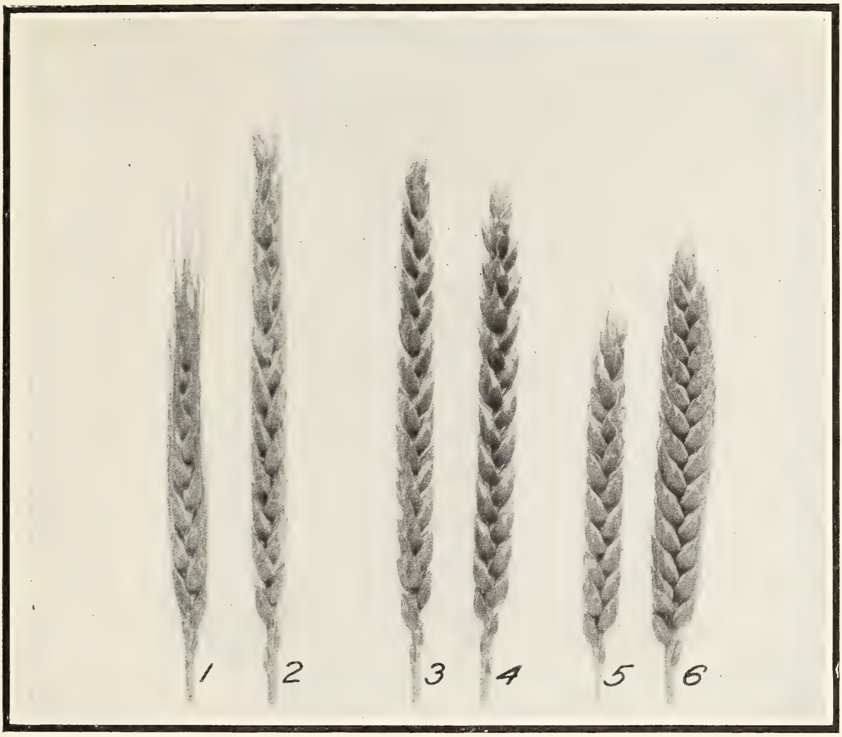
SPIKES OF AWNLESS AND AWNED VARIETIES OF WHEAT, SHOWING VARIATIONS IN LENGTH

Apical awns wanting, Bobs (1); apical awns few, White Fife (2); apical awns several, Satisfaction (3); apical awns many, Rink (4); awns midlong, Turkey (5); awns long, Kubanka (6).



SPIKE SHAPES OF WHEAT VARIETIES.

Fusiform, Ghirka (1), Rink (2); oblong, White Winter (3), Poole (4); clavate, Satisfaction (5), Arcadian (6); elliptical, Hybrid 128 (7).



SPIKE DENSITY OF WHEAT VARIETIES.

Lax, Chul (1), Martin (2); middense, Power (3), Regenerated Defiance (4); dense, Pacific Bluestem (5), Gypsum (6).

The covering and coloring of the glumes are major characters of the second and third place, respectively. The length and width of the glumes also are used, but are of only minor importance.

COVERING OF THE GLUMES.

Glumes of all varieties here discussed are described as glabrous or pubescent (Fig. 2). Host (*119*) placed the pubescent-glumed wheats in a separate species called *Triticum villosum*. Several later authors also considered pubescent wheats as different species. This character is used here, however, only as a major one in separating varieties, but is given the second place in the keys because of the definite and striking contrast between absence and presence. This action is in accordance with the usage of Koernicke and Werner.

Glumes described as glabrous are without any covering of hairs. Those described as pubescent are more or less covered with hairs of varying length. Pubescence usually is readily apparent. The degree of pubescence varies in the different varieties. On some the hairs are much longer and more numerous than on others. Glumes of some durum varieties are partly glabrous and partly pubescent, but are classed as pubescent. In such varieties the pubescence is most often found on the edge of the glumes.

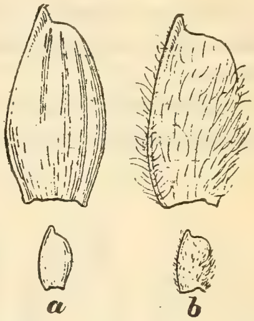


FIG. 2.—Glume covering: *a*, Glabrous; *b*, pubescent. (Natural size and enlarged 3 diameters.)

COLOR OF THE GLUMES.

Differences in glume color were early recognized. Lamarck (*134*) used these distinctions in classifying varieties. Glume color is here used as a major character and occupies third position in the key because of the distinct differences which are readily apparent when the plants are mature. This is also in accordance with the usage of Koernicke and Werner (*133*). All glumes are classed as white, yellowish, brown, or black. These colors are shown in Plate III, Figure 2.

Glumes classed as white may vary in color from a cream or pale-straw color to a dark yellow (Pl. III, Fig. 2, *a* and *b*). Practically no glumes are without color. Within the class, however, there are two rather distinct shades. Some taxonomists have classified them separately as white and yellowish. In the present bulletin, however, both shades are placed in the same class and described only by the one term " white," except in the case of the durums, which are classed separately as white and yellowish. In the descriptions the glumes of some varieties of common wheat are described as being yellowish white, indicating a darker glume than those described as white. A few varieties have white or yellowish glumes with brown or black nerves, or the glumes are sometimes tinged on the edges with brown or black. Such varieties are placed in the white-glumed class and the peculiar markings are indicated in the descriptions. The Blackhull variety has glumes which usually are tinged with black, but sometimes are almost entirely black. The Rudy variety has black stripes along the edges of the glumes.

Glumes of durum varieties classed as yellowish are much darker than those of any of the common wheats classed as white or described as yellowish white (Pl. III, Fig. 2, *d*). This yellowish class, therefore, is quite distinct. It may range in color from a buff to bronze.

The brown-glumed class usually is still darker than this yellowish class and may vary in shade from light to dark brown and bluish brown, and in some varieties there is a reddish or mahogany tinge (Pl. III, Fig. 2, *e*, *f*, and *g*). For the latter reason most taxonomists have used the term "red," but in the present work the writers prefer the term "brown," as it more accurately describes the glume color of the class as a whole.

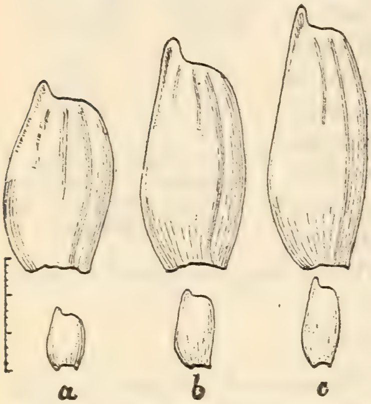


FIG. 3.—Glume length: *a*, Short; *b*, midlong; *c*, long. (Natural size and enlarged 3 diameters.)

Black-glumed wheats are rare in America. With two exceptions, and these only among the durums (Kahla, Pl. III, Fig. 2, *h*) and emmers (Black Winter), there are no commercial varieties having black glumes. The color of the glumes of these varieties varies considerably. Under very dry conditions they may be only faintly tinged and may be more of a blue than a black.

LENGTH OF THE GLUMES.

Glume lengths are described as short, midlong, and long and are used as minor characters in the varietal descriptions. These length differences are illustrated in Figure 3. Usually small-kerneled varieties have short glumes and large-kerneled varieties long glumes, but there are exceptions to this. The glumes are usually about three-fourths the length of the lemmas, although in some long-glumed varieties the glumes and lemmas more nearly approach the same length. Polish wheat, *Triticum polonicum*, has glumes as long or longer than the lemmas and is separated from the other species principally on this distinction. The length of the glume is here described as short, midlong, or long. Heuzé (*112*) and Scofield (*173*) used essentially these same terms. Most varieties of wheat have midlong glumes. A few varieties, however, are distinct in having either short or long glumes. Short glumes may have lengths varying from 6 to 10 mm. Midlong glumes may vary from 8.5 to 12.5 mm., and long glumes from 11 to 15 mm. The glumes of Polish wheat exceed this latter measurement and are described as very long.

WIDTH OF THE GLUMES.

The width of glumes is used in the same manner as the length. All glumes are described as being narrow, midwide, or wide (Fig. 4). These differences were pointed out by Scofield (*173*). The width of the glume is here determined across its center from the keel to the margin of the outer side. Narrow glumes may vary in width from 2 to 4 mm., midwide ones from 3 to 5 mm., and wide ones from 4 to 6 mm. The differences are small, and much overlapping of the classes is inescapable. Wide glumes nearly cover the lemma at the point of measurement, while narrow glumes usually cover less than a third of it.

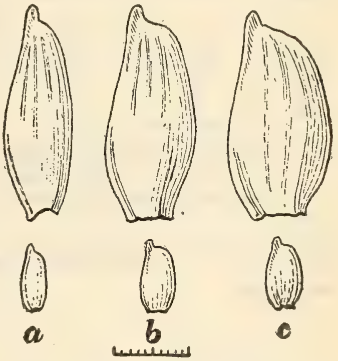


FIG. 4.—Glume widths: *a*, Narrow; *b*, midwide; *c*, wide. (Natural size and enlarged 3 diameters.)

TENACITY OF THE GLUMES.

Glumes of different varieties vary in tenacity or the firmness of attachment to the rachis. The glumes of most varieties, especially of the durums and clubs, are persistent. Some varieties of common wheat, however, have glumes which are easily deciduous, causing the spikes to shatter. This character is mentioned only for such varieties.

SHOULDER CHARACTERS.

The shoulder as here considered is the more or less rounded end of the glume from the beak to the lateral margin, including the part referred to by Koernicke and Werner (*133*), Hackel (*101*), and others as side teeth. Scofield (*173*) applied the name shoulder to this portion of the glumes.

Considerable variation exists in shoulder width and shape in different varieties and also in different spikes of the same variety and even among the glumes on a single spike. Although variable, they are of considerable minor value in classification.

WIDTH OF THE SHOULDER.

The shoulder widths often differ from the glume widths. For this reason they are described separately, but on the same basis of measurement and by the use of the same terms, narrow, midwide, and wide (Fig. 5).

SHAPE OF THE SHOULDER.

Shoulder shapes are described in overlapping terms which allow for a considerable variation, which is nearly always present in the same spike. The terms used are wanting, oblique, rounded, square, elevated, and apiculate. These shapes are shown in Figure 6.

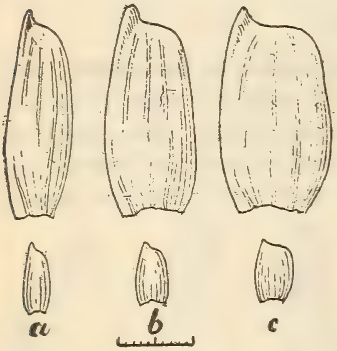


FIG. 5.—Shoulder widths: *a*, Narrow; *b*, midwide; *c*, wide. (Natural size and enlarged 3 diameters.)

BEAK CHARACTERS.

The word "beak" is used here for the short projection which terminates the keel of the glume. In some varieties it aproaches an awn in appearance. Scofield (*173*) first used the term beak, previous authors having referred to it as a tooth or point. The beaks vary in width, shape, and length. These characters are of considerable minor importance in identification and are used in the descriptions of the varieties.

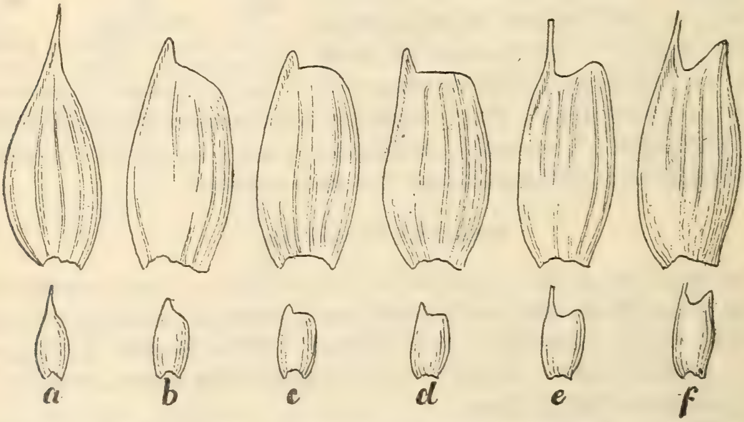


FIG. 6.—Shoulder shapes: *a*, Wanting; *b*, oblique; *c*, rounded; *d*, square; *e*, elevated; *f*, apiculate. (Natural size and enlarged 3 diameters.)

WIDTH OF THE BEAK.

Beak widths are described as narrow, midwide, and wide (Fig. 7). The average beak is only about 1 mm. wide, so the variations are very small, and general observation is the only basis for describing them. Those that are wider than the average are called wide, and those that are narrower are called narrow.

SHAPE OF THE BEAK.

The apex of the beak varies considerably in shape. It is described as obtuse, acute, and acuminate. Obtuse beaks are blunt at the apex. Acute beaks come to a point at the apex. Acuminate beaks are narrowly and very sharply pointed. All awned spikes have acuminate beaks. These shapes are shown in Figure 8.

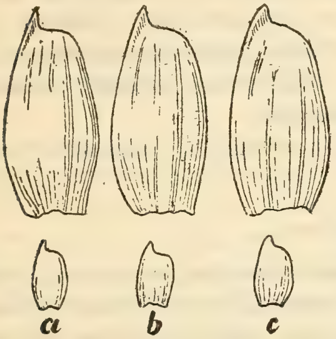


FIG. 7.—Beak widths: *a*, Narrow; *b*, midwide; *c*, wide. (Natural size and enlarged 3 diameters.)

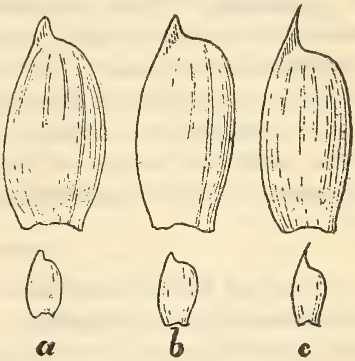


FIG. 8.—Beak shapes: *a*, Obtuse; *b*, acute; *c*, acuminate. (Natural size and enlarged 3 diameters.)

LENGTH OF THE BEAK.

Beak lengths are quite variable, especially in the awned varieties, and are considerably influenced by environment. In general, conditions which increase or decrease the length of the beak affect nearly all varieties to a similar degree. In the awnless wheats the differences in length are not great, but in many varieties they are quite distinct. The length of the beak is measured from the shoulder of the glume upward. On most awned wheats the length increases from the base of the spike to its apex. The range of difference varies greatly with the variety. For this reason no definite measurements are used in describing the lengths, but instead the average maximum and minimum lengths are recorded in millimeters. None of the awnless varieties here de-

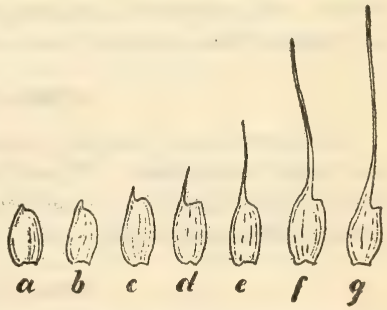


FIG. 9.—Beak lengths, showing seven variations. (Natural size.)

scribed have beaks longer than 3 mm. Variations in beak lengths are shown in Figure 9.

AWN CHARACTERS.

Certain characters of the awn are distinct. Some of these are of some importance in classification, while others are not. The divergence of the awn from the vertical is one of the latter. The awns of some varieties are all nearly vertical or appressed, while others are spreading. These characters are affected by drought or other abnormal conditions and usually are not sufficiently constant for classification purposes. The awns of some varieties sometimes are deciduous, dropping off at maturity. This occurs so rarely, however, that it is of little or no use in classification.

The color and length of the awns, however, are factors of some importance in this classification.

COLOR OF THE AWN.

In the key to the varieties of durum wheat the awn color is used as the fourth major character. This method was followed by Koernicke and Werner. For the other species and subspecies the awn color is used only as a minor character. All awns are described as white or black. The awn colors and variations in color are shown in Plate III, Figure 1, *c*, *d*, *e*, and *f*. The white class may include yellowish shades, and the black class may include shades of brown and blue. Few varieties of common wheat have really black awns.

LENGTH OF THE AWN.

The length of the awn in awned varieties or of the apical awns of varieties described as awnless is of slight value in classification. No attempt has been made in these studies to separate the varieties into classes with respect to awn length. In all descriptions, however, the average extreme lengths are recorded in centimeters.

KERNEL CHARACTERS.

The kernel color, length, and texture are the most constant of all the kernel characters. These are used as major distinctions. The shape of the kernel is considered only of minor importance, as are certain differences of the germ, crease, cheeks, and brush.

COLOR OF THE KERNELS.

Kernel colors were early recognized as important characters in separating varieties. Most varieties were observed to have either white or red kernels, but were sometimes regarded as being yellow or brown. The kernel color was used by Koernicke and Werner

(*133*) and by Vilmorin (*199*) as one of the leading taxonomic characters of wheat. Heuzé and Koernicke and Werner have indicated various shades of white or yellow and of red in the descriptions of the kernel color. Eriksson (*88*) believed that white wheat becomes red and states that the color of grain is useless in distinguishing a variety. Cobb (*69*) arranged the wheats he was growing according to the color tint from lightest to darkest. Howard and Howard (*121*, p. 288) regard the wheat kernel as being either white or red. They state that "the particular tone or color depends partly on the consistency of the grain." Hayes, Bailey, Arny, and Olson (*105*) proposed the use of the terms "red" and "white" in describing the presence and absence of a brownish red pigment in the bran layer. The use of the modification "light red" was suggested where the degree of pigmentation was less than usual in the red wheats. Three varieties of Abyssinian wheat having violet-colored kernels were mentioned by Koernicke and Werner (*133*). The writers have grown some purple-kerneled wheats from Abyssinia, but they are not considered in the present classification of the American varieties.

Kernels of all varieties are here grouped into two classes, described as white and red. Here, as in the glume colors, many different shades are present. In general, however, the two classes distinctly separate all wheats. Kernels showing the two colors and some of the variations that are found in normal and starchy samples are illustrated in Plate VII, Figure 1.

Kernels of the white class may vary from cream to yellowish, or they may be white, without pigment. White or faintly pigmented kernels may appear to have different shades of yellow color, because of differences in texture of the endosperm. Different textures of endosperm, ranging from starchiness to horniness, result in different color shades varying from white to yellow.

Kernels of the red class may vary from light brown to the darker shades of red. The variations are due to varietal differences and environment. Differences in texture, due to varying conditions, may cause "yellow berries," which sometimes gives the kernels a mottled appearance.

Many American writers have classed some varieties as "amber." This usually refers to a white kernel having a translucent or vitreous endosperm. The term "amber" is used to designate a certain subclass of durum wheat in the U. S. Official Grain Standards. Hard red kernels frequently have been referred to as amber colored. The word "amber" also has been used as a part of a varietal name, such as Martin Amber, which is a soft white wheat, and Michigan Amber, which is a soft red wheat. Because of this ambiguity and because all American wheats are either red or white, the word "amber" should not be used in describing wheat kernels.

LENGTH OF THE KERNEL.

The length of the kernel is used here as a major character in distinguishing varieties of common and club wheat.

Koernicke and Werner (*133*), in their descriptions of wheat varieties, indicated the average length and width of the kernels in millimeters and the average number of kernels in 10 grams. The kernels were described as very small, small, large, and long. Heuzé (*112*) described the kernels as short, medium, or long. The size of the kernels of any variety varies slightly when grown in different sections or in different years in the same section. From necessity, therefore, the limits of the classes in which varieties are placed must be overlapping. A kernel of wheat reaches its maximum length several days before ripening. The length, therefore, is fairly constant, even when it is considerably shrunken, and is the most valuable of the kernel dimensions for taxonomic purposes. In making measurements only the normal kernels should be used. The kernels from the tip spikelets on a spike and from the upper florets in the spikelet are below normal in length.

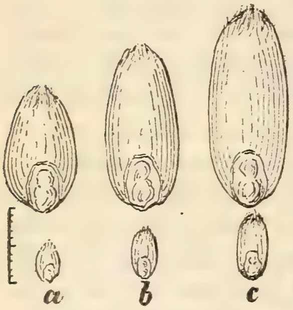


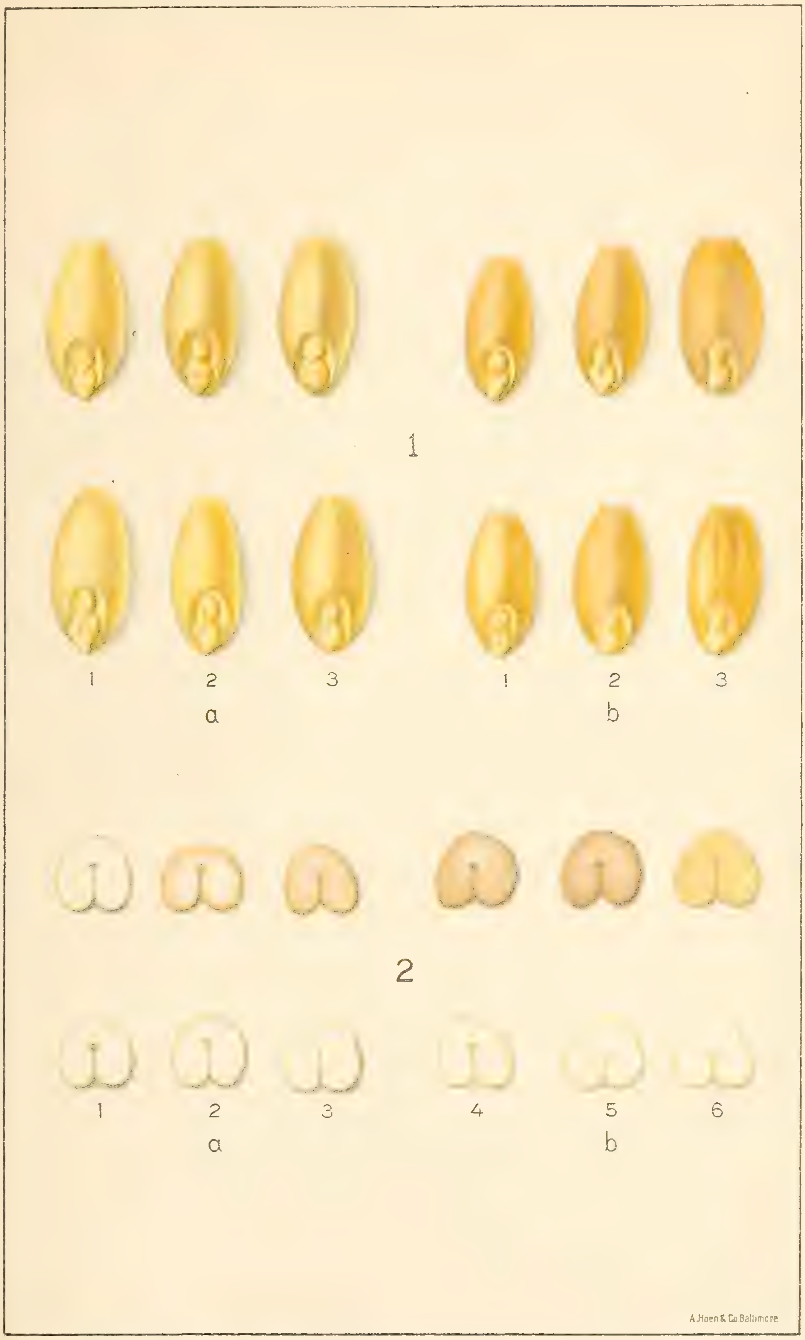
FIG. 10.—Kernel lengths: *a*, Short; *b*, midlong; *c*, long. (Natural size and enlarged 3 diameters.)

In the keys two classes are made, namely, kernels short to midlong and kernels midlong to long. In the descriptions three classes—short, midlong, and long—sometimes are mentioned separately. These kernel lengths are shown in Figure 10.

The short to midlong class includes varieties whose kernels measure within the limits of 4 to 7.5 mm. in length. The midlong to long class includes varieties whose kernels come within the limits of 6.5 to 10 mm. For individual samples more definite limitation is possible. For this purpose the term " short " is used for kernels varying from 4 to 6 mm. in length; " midlong " for those varying from 6 to 8 mm., and " long " for those varying from 8 to 10 mm. These latter measurements are considered as minor characters and are occasionally used in descriptions either alone or usually following the adjective. The measurements, enlarged ten times, are illustrated in Figure 11.

TEXTURE OF THE KERNEL.

The texture of wheat kernels is an important character in classification. It has an economic value in America, as most wheat is marketed in commercial classes, which are fixed largely on a basis of texture, because hard wheats generally are better for milling and bread making than soft wheats.



KERNELS AND CROSS SECTIONS OF WHEAT KERNELS.

Fig. 1.—Kernels of wheat varieties showing the colors: (*a*) White, 1, Goldcoin; 2, Baart; 3, Kubanka; (*b*) red, 1, Fultz; 2, Turkey; 3, Pentad. The lower row shows "yellow-berry" kernels of these varieties. (Enlarged 3 diameters.) FIG. 2.—Cross sections of wheat kernels of varieties having different textures: Soft, (1) Kofod, (2) Zimmerman; semihard, (3) Jones Fife, (4) Champlain; hard, (5) Marquis, (6) Kubanka; 1, 2, and 3 are classed as soft to semihard, and 4, 5, and 6 as semihard to hard. (Enlarged 3 diameters.)

The texture classes used here are two—kernels soft to semihard and kernels semihard to hard. Here, as with size, overlapping class limits were found to be necessary. In general, all wheat varieties can be classed readily in one or the other of these two groupings. In describing specific samples and in individual description of varieties, three classes are used separately, as soft, semihard, and hard. A soft wheat is one which, when normally developed, has an endosperm entirely soft, mealy, or starchy. A hard kernel, when normally developed, has a corneous, horny, or vitreous endosperm throughout. A semihard kernel has an endosperm which is intermediate between the two. Cross sections of kernels showing differences in texture in both normal and yellow-berry kernels are shown in Plate VII, Figure 2. The upper series of kernels shows normal development and the lower series the yellow-berry condition. In Figure 2 *a*, (1) and (2) represent different degrees of softness and (3) the semihard condition in the soft class. In Figure 2, *b*, (4) shows the semihard condition and (5) and (6) different degrees of hardness.

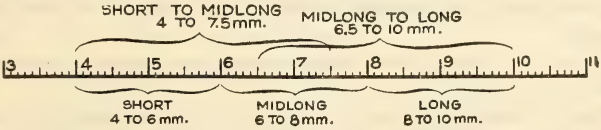


FIG. 11.—Diagram showing measurements of kernel lengths: Above, major characters; below, minor characters. (Enlarged 10 diameters.)

The species *Triticum durum* was so named by Desfontaines (*79*) because of the hardness of the kernels. Metzger (*143*) divided the white-kerneled wheats into two groups on the basis of texture, the starchy ones being considered as yellow. Koernicke and Werner (*133*) described the wheat kernels of different varieties as being entirely mealy, nearly entirely mealy, mostly mealy, partly mealy, partly glassy, mostly glassy, nearly entirely glassy, and entirely glassy. The texture of the same variety varied in different seasons. These authors, as well as Eriksson (*88*), Fruwirth (*92*), and Howard and Howard (*121*, p. 232), conclude that kernel texture is useless as a varietal character and that it depends on environment. Hayes, Bailey, Arny, and Olson (*105*) suggest the terms corneous, subcorneous, substarchy, and starchy for describing the texture of the wheat kernel. The writers have concluded that because of the variability in texture under different environments one can separate varieties of wheat accurately into only two classes and fairly accurately into three classes. Soft-kerneled varieties grown under very dry conditions will sometimes become brittle and slightly subcorneous. When hard-kerneled varieties are grown under humid conditions or in soil deficient in nitrogen they sometimes become starchy, semistarchy, or mottled, the condition being designated as "yellow berry," and are then rather soft.

The difficulty of the numerous investigators in determining the kernel texture has been due to the failure to dissociate softness from starchiness or yellow berry. Freeman (*91*) has shown the nature of hardness in the wheat kernel. The following is quoted from his conclusions:

> 1. The hardness of a wheat is determined by the solidity of the grain, and this, in turn, by the nature and relative proportions of gluten and starch in the endosperm.
>
> 2. When the ratio of gluten to starch is sufficiently high, the entire cell contents are cemented together solidly as the grain dries out in ripening. It, therefore, takes on a hard, glassy, semitranslucent texture. In the absence of a sufficient proportion of gluten to hold the cell contents together, the shrinkage in drying does not fully compensate for the loss of water, and air spaces appear within the cells. These open spaces render the grain soft and, also, since they serve as refracting surfaces, make it opaque. We are, therefore, accustomed to associate softness, opaqueness, and low gluten content in wheats.
>
> 3. There are two types of soft grains among the wheats included in these experiments.
>
> (*a*) A type designated by the writer as "true softness," in which the air spaces in the endosperm are diffuse and finely scattered. This type of softness is only slightly affected by environic conditions.
>
> (*b*) A type commonly called "yellow berry," in which the air spaces within the endosperm occur in flakelike groups with quite definite margins. The opaqueness thus arising may be confined to a small spot only or may include the entire endosperm. This type of softness is very sensitive of environic conditions.

In this bulletin soft texture refers to the condition designated above as "true softness" and must not be confused with yellow berry.

True kernel texture, therefore, can not be determined on yellow-berry kernels, because they always are soft. It usually is possible, however, to select from a sample a few kernels which are not wholly starchy and which can be accurately used for texture determinations. Roberts (*159*) has attempted to measure hardness mechancially by determining the crushing strength. This is not entirely accurate, as the shape of the kernel influences its crushing strength and, in addition, soft-wheat varieties grown under dry-land conditions are quite brittle and difficult to crush. Texture is determined by cutting kernels which are not affected by yellow berry and examining the endosperm.

SHAPE OF THE KERNEL.

The shape of kernel outline is described as ovate, elliptical, or oval. These terms refer only to the outline of the kernel as viewed from the dorsal surface, and not to the kernel as a whole. When egg-shaped in outline, the germ end being the broader, it is described as ovate. An elliptical kernel outline is one the length of which is more than twice the width and which has sides somewhat curved and both ends rounded. An oval kernel outline is broader, like the ovate, but with both ends of nearly equal width. The three shapes, ovate, elliptical, and oval, are shown in Figure 12, *a*, *b*, and *c*. Modifications of these shapes are indicated by describing kernels as narrowly or broadly elliptical, ovate, or oval, as the case may be. A few varieties, as Baart, show other characteristic shapes, which are given in the descriptions of these varieties.

Most kernels are classified as ovate, but in a few varieties a considerable portion of the kernels may have one or the other of the shapes just noted. The shape of the wheat kernel is influenced by the position in the spikelet, the position in the spike, and the degree of plumpness. Boshnakian (*49*) has shown that spikelet characters which affect the shape of the wheat kernel are mainly: "(1) The stiffness of the glumes, (2) the size and shape of the space in which the grain develops, (3) the number of grains in the spikelet and their position, (4) the density of the head, (5) the pressure caused by the growth of different parts of the head, and (6) the species which produces the kernel." The kernels from the base or tip spikelets on the spike are shorter in proportion to width than the others. The kernels from club wheat or from the tip spikelets of clavate spikes of common wheats are usually laterally compressed or "pinched." Shrunken kernels usually have an elliptical shape because of being narrow. As the width of a kernel of wheat depends largely upon the degree of development of plumpness, this character has very little taxonomic value.

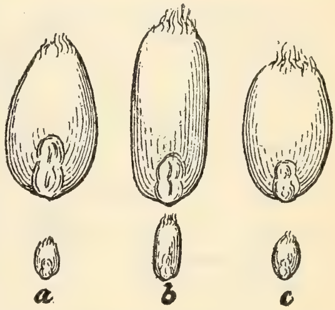


FIG. 12.—Kernel shapes: *a*, Ovate; *b*, elliptical; *c*, oval. (Natural size and enlarged 3 diameters.)

The tip or brush end of nearly all varieties is rounded, but the kernels of a few varieties, in which the tips are square rather than rounded, as seen from the dorsal view, are described as truncate. Kernels of a few varieties have acute or pointed tips, as seen in both dorsal and lateral views, and such tips are described as acute.

The shape of the kernel as seen in the lateral view is important in only a few varieties. Many varieties, especially durums and emmers, are more or less keeled on the dorsal surface. Normally the kernels of wheat, in dorso-ventral diameter, are thickest near the base, just above the germ. In a few varieties the kernels are strongly elevated on the dorsal side of this basal portion and then are popularly known as "humped." That term is used in describing such kernels.

When the dorsal portion is less keeled than normal the kernel is described as flattened. Where only the tip of the kernel is thus flattened it is described as having a flattened tip.

The shape of the kernel has been used as a distinguishing character by only a few authors. Koernicke and Werner (*133*) recorded the lengths and widths of the kernels and referred to some as roundish or elongated. Eriksson (*88*) used the number of kernels in 100 mm., placed side by side, to indicate the width of the kernel. This character is, however, of value only in comparing varieties grown under identical conditions. Heuzé (*112*) described the shape of kernels of each variety, using such terms as elongated, short, angular, compressed, ovoid, oblong, and swollen. Scofield (*173*) suggested 16 descriptive terms to be applied to the shape of wheat kernels. Wheat kernels can not be accurately described according to shape unless they are nearly normally developed, that is, neither shrunken nor excessively plump.

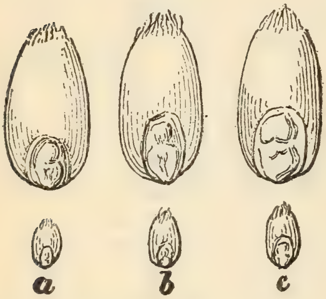


FIG. 13.—Germ sizes: *a*, Small; *b*, midsized; *c*, large. (Natural size and enlarged 3 diameters.)

GERM CHARACTERS.

The size and shape of the germ or embryo of the wheat kernel have seldom been used as characters in classification. After examining thousands of samples, the writers have concluded that the size of the germ is one of the most constant of minor kernel characters. There is considerable variation among the individual kernels of a bulk sample, but typical kernels of a pure variety have a characteristic size of germ. The germ is developed earlier than the endosperm and consequently is of almost normal size even in shrunken grain.

The germ is here described as small, midsized, or large. These are shown in Figure 13. A small germ is one which occupies less than one-sixth of the area of the dorsal surface of the kernel or the area visible in dorsal view. A midsized germ occupies from one-sixth to one-fourth of the dorsal area of the kernel. A large germ occupies one-fourth or more of the dorsal area.

The limits of the three size-groups overlap. Most kernels have a midsized germ, so these characters are not much used in distinguishing varieties. For some varieties, however, they could be used to advantage by men in the grain trade.

CREASE CHARACTERS.

The crease or sulcus on the ventral side of the wheat kernel is quite variable, but is of value in distinguishing a few varieties. The chief taxonomic characters are the width and the depth. Shrunken kernels nearly always have a relatively wide and deep crease, while in extremely plump or yellow-berry kernels the crease is narrow and shallow because the space beneath the bran is occupied by large starch cells and air spaces.

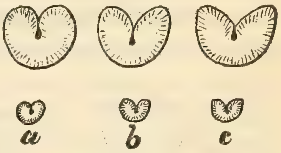


FIG. 14.—Crease widths: *a*, Narrow; *b*, midwide; *c*, wide. (Natural size and enlarged 3 diameters.)

WIDTH OF THE CREASE.

The width of the crease is determined by the distance between the crests of the cheeks on each side of the crease. Creases are described as narrow, midwide, and wide. These differences are illustrated in the cross sections of kernels shown in Figure 14. A narrow crease is about two-thirds or less of the total width of the kernel in ventral view. The midwide crease, which is typical of most varieties, is usually about four-fifths of the total kernel width. A wide crease is almost the total width of the kernel.

DEPTH OF THE CREASE.

The depth of the crease in this classification has been determined by an external examination rather than by a cross section of the kernel. The depth, therefore, is measured from the crest of the cheeks to the position where the crease is closed. No measurements of the portion of the crease below the surface of the kernel have been considered. Crease depths are described as shallow, middeep, and deep. These differences are shown by cross sections of kernels in Figure 15. A shallow crease has a depth of 20 per cent or less of the dorsoventral thickness of the kernel. A middeep crease has a depth from 15 to 35 per cent of the thickness of the kernel, and a deep crease has a depth of 30 to 50 per cent of the thickness of the kernel.

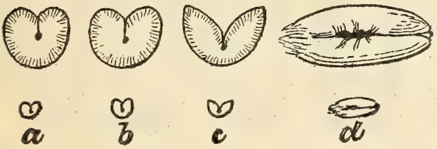


FIG. 15.—Crease depths: *a*, Shallow; *b*, middeep; *c*, deep; *d*, pitted. (Natural size and enlarged 3 diameters.)

The depth of the crease is of taxonomic value only when the kernels are normally developed and is a distinguishing character in only a few varieties. It is sufficiently constant, however, to be of use in describing varieties grown under identical and normal conditions. Nearly all of the durum and club wheats have a shallow crease. A few varieties of common wheat have been described as having a "pitted" crease. This is characterized by having a distinct opening near the center of the crease (Fig. 15, *d*). The sides of the opening usually are wrinkled. The pitted character is most marked on the kernels of the Humpback and Huston varieties.

CHEEK CHARACTERS.

The cheeks of a kernel are the ridges along each side of the crease on the ventral surface of the kernel. The most distinguishing character of the cheek is the outline of the crest in cross section. This is described as rounded or angular. These shapes and some of the variations that exist in each are shown in Figure 16. Extremely starchy (yellow-berry) kernels always have rounded cheeks, while the cheeks of shrunken kernels are always angular. It is necessary, therefore, to examine normally developed kernels in order to recognize the differences. All of the durum wheats have angular cheeks. Most of the common wheats have cheeks which are more or less angular, but a few varieties, such as China and Turkey, consistently have rounded cheeks. There is no sharp distinction between the angular and the rounded cheeks.

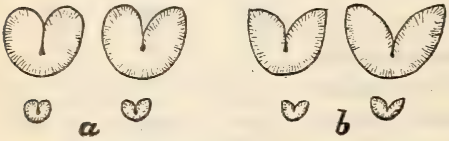


FIG. 16.—Cheek shapes: *a*, Rounded; *b*, angular. (Natural size and enlarged 3 diameters.)

BRUSH CHARACTERS.

The brush of the kernel is the hair at the tip or the end opposite the germ. Cobb (*71*) described in detail the brush of 50 varieties of wheat grown in Australia.

SIZE OF THE BRUSH.

The size of brush refers to the area which it occupies on the kernel. The area of the brush is described as small, midsized, and large. These differences are shown in Figure 17, *a*, *b*, and *c*. A small brush is one which occupies only a portion of the tip of the kernel. In kernels which are distinctly pointed at the tip, however, it may cover all of the end, but because of the small area occupied it is still referred to as small. A midsized brush covers the tip of the kernel. Nearly all varieties of wheat come within this class. A large brush is one which extends partly over the sides of the kernel, chiefly along the crease.

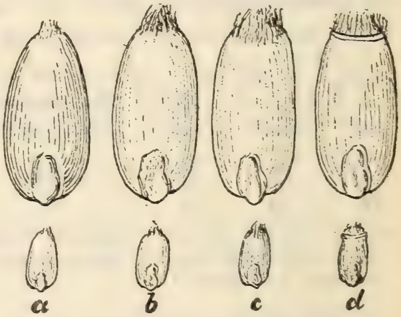


FIG. 17.—Brush sizes: *a*, Small; *b*, midsized; *c*, large; *d*, collared brush. (Natural size and enlarged 3 diameters.)

LENGTH OF THE BRUSH.

The length of brush refers to the average length of hairs, which are described as short, midlong, and long. These lengths are shown in Figure 18. In short brush the hairs are less than 0.5 mm. long, in midlong brush from 0.5 to 1 mm. long, and in long brush more than 1 mm. long.

All durum wheats and some varieties of common wheat, such as Bobs and Prelude, have a short brush. A few very long hairs may be present in a short brush. Humpback and Mealy are varieties of common wheat having a long brush. Both the size and the length of the brush are very constant characters, probably the most constant kernel characters aside from color and size. In machine thrashing, part of the hairs of the brush frequently are removed. The brush area of some varieties is here described as "collared" (Fig. 17, *d*). Cobb (*71*) referred to this as an abrupt margin. This refers to the presence of a distinct raised collar or flange of bran along the margin of the brush area. This is most noticeable on shrunken kernels, but is very distinct on normal kernels of a few varieties, such as Goldcoin and Champlain.

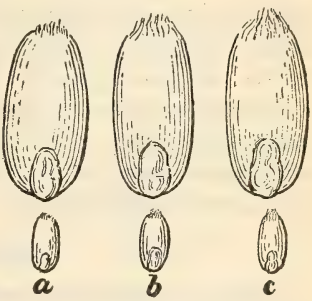


FIG. 18.—Brush length: *a*, Short; *b*, midlong; *c*, long. (Natural size and enlarged 3 diameters.)

PHYSIOLOGICAL CHARACTERS.

Several characters of wheat varieties of interest to growers can not be observed in a morphological examination. These differences are of a physiological or internal nature. They are of great economic importance, but are of little value in classification. Following the descriptions of many of the varieties, therefore, certain of the physiological characters here mentioned are considered.

The leading physiological characters of importance in wheat varieties are productivity, milling and bread-making values, resistance to low temperatures, and resistance to diseases.

PRODUCTIVITY.

A comparison of yield is of value only in comparing different varieties of wheat grown under identical conditions, as side by side, on identical soil, or in one locality in the same season. Under certain conditions it is possible for almost any variety to outyield all others, and consequently an expression of yield is of little taxonomic importance unless definite experiments at several points show a variety to be significantly high or low in yield. Koernicke and Werner (*133*) recorded the yields of the varieties grown at Poppelsdorf in the description of each variety. In the present work the writers have mentioned productivity or yield following the descriptions of only a few varieties, which experiments have shown to be distinctly high or low in yield.

MILLING AND BREAD MAKING.

Next to productivity, the value of wheat varieties for milling and bread making probably is of the greatest economic importance, as this is the principal use for wheat. There are significant differences in milling and bread-making values of different varieties. As in yield, these differences can be accurately determined only by careful experiments, identically conducted with comparable samples. Previous authors have not used these differences in distinguishing varieties. Where definite experiments have shown certain varieties to be unusually good or poor for milling or bread making, these differences are here pointed out, following the description.

RESISTANCE TO LOW TEMPERATURE.

Hardiness or resistance to low temperatures consists of both the ability to survive low winter temperature and resistance to injury from spring and summer frosts. Very little is known concerning the latter character. The winter hardiness of several varieties was recorded for three years by Eriksson (*88*) and the hardiness of many varieties was given by Koernicke and Werner (*133*). Following the descriptions here given, the writers have indicated a few varieties which are known to be especially winter hardy, but otherwise the character is not mentioned.

RESISTANCE TO DISEASES.

Wheat varieties are known which have more or less resistance to each of the various diseases of wheat. Practically all varieties of wheat have been grown in nurseries where they were infected either naturally or artificially, so as to be able to observe any marked resistance to stem rust (*Puccinia graminis*), leaf rust (*P. triticina*), stripe rust (*P. glumarum*), and bunt or stinking smut (*Tilletia tritici* and *T. foetens*). The presence of resistance can be determined only when all varieties have been equally exposed to all strains of a disease under conditions favorable for their development. A few varieties have shown a distinct resistance to stem rust or to bunt, and this fact is noted following their descriptions.

CLASSIFICATION OF THE GENUS TRITICUM.

Wheat belongs to the grass family, Poaceae (Gramineæ), and to the tribe called Hordeæ, in which the 1 to 8 flowered spikelets are sessile and alternate on opposite sides of the rachis, forming a true spike. Wheat is located in the subtribe Triticeæ and in the genus Triticum, where the solitary 2 to many flowered spikelets are placed sidewise against the curved channeled joints of the rachis.

There are two sections of the genus Triticum, one including the old genus Aegilops, in which the glumes are flat or rounded on the back, and the other including Sitopyrus, in which the glumes are sharply keeled and in which are found all cultivated forms. This bulletin is concerned only with the latter section of the genus Triticum.

There are many forms of einkorn, spelt, and emmer (including the so-called "wild wheat" of Palestine) which are not cultivated in the United States and, therefore, are not considered in these pages.

Wheat is characterized as a midtall annual grass with flat blades and a terminal spike. The spikelets are solitary, 1 to 5 flowered, sessile, arranged alternately on the nodes of a zigzag, channeled, articulate rachis; the rachilla of the spikelets disarticulating above the glumes and between the florets, or continuous; the glumes keeled, rigid, and 3 to several nerved, abruptly acute or acuminate; the lemmas keeled or rounded on the back, many nerved, ending in a single tooth or awn.

The following eight divisions of wheat varieties were used by Hackel (*101*, p. 180–187), and have been recognized by others:

Triticum	sativum	tenax	vulgare Vill.	Common wheat.
			compactum Host.	Club wheat.
			turgidum L.	Poulard wheat.
			durum Desf.	Durum wheat.
		dicoccum Schr.		Emmer.
		spelta L.		Spelt.
	polonicum L.			Polish wheat.
	monococcum L.			Einkorn.

Only three of these divisions were considered by Hackel as valid and distinct species, namely, *sativum*, *polonicum*, and *monococcum*. The other divisions he called races and subraces. The term race is now more properly used for a pure line within a variety, and these ranks probably would be better designated as subspecies and varieties. As previously pointed out, other authors have considered these divisions as distinct species or subspecies. The present writers have not yet given sufficient study to the question of their botanical relationships to express a positive opinion.

In the present work it seems best to maintain these well-established divisions, but at the same time to rearrange their order. The writers make no attempt to assign definite rank to the different divisions, as they have not made a cytologic study of them or a genetic study of crosses between the different divisions nor have they made an exhaustive morphological study of existing varieties or strains which are of a type intermediate between any of the eight divisions. Such studies were not projected as a part of these investigations. The divisions which have been established or recognized as species or subspecies by different authors, however, may be distinguished by the accompanying key.

KEY TO THE SPECIES OR SUBSPECIES.

- 1a. Terminal spikelets fertile; palea remaining entire at maturity; spikelets with 2 to 5 fertile florets.
  - 2a. Glumes shorter than the lemmas, firm; palea as long as the lemmas. (*Triticum sativum* Lam.)
    - 3a. Rachis tenacious; kernels separating from the chaff when thrashed.
      - 4a. Glumes distinctly keeled only in the upper half; lemmas awnless or awns less than 10 cm. long; straw hollow.
        - 5a. Spikes usually long, dense to lax, somewhat dorsally compressed. (*T. aestivum* L., *T. vulgare* Vill.) ... COMMON WHEAT ... Page. 50
        - 5b. Spikes short, dense, laterally compressed. (*T. compactum* Host.) ... CLUB WHEAT ... 172
      - 4b. Glumes sharply keeled at the base; lemmas usually awned; awns 10 to 20 cm. long; straw usually solid.
        - 5a. Glumes and kernels short; kernels ovate, with truncate tips. (*T. turgidum* L.) ... POULARD WHEAT ... 180
        - 5b. Glumes and kernels longer; kernels usually elliptical. (*T. durum* Desf.) ... DURUM WHEAT ... 183
    - 3b. Rachis fragile; kernels inclosed in glumes when thrashed.
      - 4a. Spikes dense, laterally compressed; pedicel short, slender, usually attached to base of spikelet; shoulders wanting to narrow, usually oblique. (*T. dicoccum* Schrk.) ... EMMER ... 193
      - 4b. Spikes lax, narrow; pedicel long, wide, attached to face of spikelet below; shoulders wide, square. (*T. spelta* L.) ... SPELT ... 195
  - 2b. Glumes as long as or longer than the lemmas, papery, lanceolate; palea of lower flowers half as long as their lemmas. (*T. polonicum* L.) ... POLISH WHEAT ... 197
- 1b. Terminal spikelets sterile, often scarcely visible; palea falling into two parts at maturity; spikelets usually with only one fertile floret.
  - 2a. (*T. monococcum* L.) ... EINKORN ... 198

COMMON WHEAT.

In the Species Plantarum, Linné (*140*) first used the name *aestivum* for a part of the common and club wheats. This name originally referred to the awned spring forms. It has recently been used by some authors for the name of the subspecies commonly recognized as *Triticum sativum vulgare*. This name was applied to the common wheats by Villars in 1787, after it was pointed out that Linné's separations were not logical or correct. The name *vulgare* is usually preferred, because it means common, and has been almost universally accepted for more than 100 years.

Common wheat is distinguished from the other species or subspecies by a spike long in proportion to its thickness. The spike is usually dorsally compressed and is thus wide when seen in face view of the spikelets instead of narrow, as with those of some other divisions. The spikelets are 2 to 5 flowered, far apart, only slightly overlapping, pressed close to the rachis, and nearly erect. The glumes are keeled only in the upper half, shorter than the lemmas, firm, and either glabrous or pubescent. The lemmas are awnless or have awns less than 10 cm. long. The palea is as long as the lemmas and remains entire at maturity. The culm of the plant usually is hollow, but occasionally is pithy within, and varies in strength and height. The blades of the leaves are usually narrower than those of the durum and poulard wheats. The kernels may be either soft or hard.

The greatest economic characteristic of common wheat is its well-known quality for bread making, as it excels all the other divisions in this important factor. It is also the best known and most widely cultivated of all the divisions and comprises more than four-fifths of the total number of varieties grown in the United States. More than 180 are distinguished by the following key. The varieties are most nearly related to the club wheats (*Triticum compactum*), but this separation of Host (*119*) is here used principally because of the greater density of the spike.

Common wheat is widely adapted to varying climatic conditions and possesses more diverse characteristics than any of the other divisions. The cultivated varieties are distinguished by the accompanying key.

KEY TO THE VARIETIES OF COMMON WHEAT.

- 1a. SPIKE AWNLESS.
  - 2a. GLUMES GLABROUS.
    - 3a. GLUMES WHITE
      - 4a. KERNELS WHITE (*Triticum vulgare albidum* Al.).
        - KERNELS SHORT TO MIDLONG.
          - KERNELS SOFT TO SEMIHARD.
            - WINTER HABIT.
              - Spike fusiform. Page.
                - Plant midtall; spike dense, erect .... WINTER BLUESTEM 58
                - Plant tall; spike lax, nodding .... MARTIN 58
              - Spike oblong.
                - Spike erect.
                  - Keel straight above.
                    - Shoulders narrow, oblique to square .... PROHIBITION 59
                    - Shoulders wide, square to elevated .... GREESON 60
                  - Keel incurved above.
                    - Spike blunt at apex .... WHITE WINTER 60
                    - Spike tapering at apex .... CHALLENGE 60
                    - Spike sometimes slightly clavate .... EATON 61
                - Spike inclined to nodding .... WHITE WONDER 61
              - Spike clavate .... SATISFACTION 61
            - SPRING HABIT.
              - Spike fusiform
                - Plant early, short.
                  - Apical awns wanting .... EARLY DEFIANCE 62
                  - Apical awns several, 2–15 mm. long. COLORADO NO. 50 62
                - Plant midseason, midtall.
                  - Apical awns wanting .... TOUSE 62
                  - Apical awns few, straight .... DEFIANCE 63
                  - Apical awns many, incurved .... RINK 64
              - Spike oblong.
                - Plant early, midtall .... BUNYIP 64
                - Plant midseason, tall.
                  - Glumes yellowish .... PACIFIC BLUESTEM 65
                  - Glumes bronze .... MEXICAN BLUESTEM 66

- 1a. SPIKE AWNLESS—Continued.
  - 2a. GLUMES GLABROUS—Continued.
    - 3a. GLUMES WHITE—Continued.
      - 4a. KERNELS WHITE—Continued.
        - KERNELS SHORT TO MIDLONG—Continued.
          - KERNELS SOFT TO SEMIHARD—Continued.
            - SPRING HABIT—Continued.
              - Spike clavate.
                - Plant early to midseason. — Page.
                  - Spike erect .... DART 66
                  - Spike inclined .... GYPSUM 67
                - Plant late.
                  - Culm and spike only slightly glaucous .... SURPRISE 67
                  - Culm and spike very glaucous .... DICKLOW 68
          - KERNELS SEMIHARD TO HARD.
            - SPRING HABIT.
              - Spike fusiform.
                - Plant early.
                  - Apical awns wanting .... BOBS 69
                  - Apical awns few, 3–5 mm. long .... QUALITY 69
                - Plant midseason .... WHITE FIFE 70
              - Spike oblong.
                - Plant early .... WHITE FEDERATION 71
                - Plant midseason; kernels midsized .... LYNN 71
                - Plant late; kernels small .... REGENERATED DEFIANCE 72
        - KERNELS MIDLONG TO LONG.
          - KERNELS SOFT TO SEMIHARD.
            - SPRING HABIT.
              - Spike oblong .... NEW ZEALAND 72
              - Spike clavate .... PILCRAW 72
      - 4b. KERNELS RED (*T. v. lutescens* Al.).
        - KERNELS SHORT TO MIDLONG.
          - KERNELS SOFT TO SEMIHARD.
            - WINTER HABIT.
              - Stem white.
                - Spike fusiform.
                  - Spike erect.
                    - Plant early .... RICE 73
                    - Plant midseason .... MINHARDI 73
                  - Spike inclined.
                    - Plant midseason.
                      - Shoulders wanting to narrow, oblique .... LOFTHOUSE 74
                      - Shoulders midwide, oblique to square .... BIG FRAME 74
                    - Plant late .... BUFFUM NO. 17 75
                  - Spike nodding.
                    - Plant early, midtall .... LEAP 75
                    - Plant midseason, midtall .... ONTARIO WONDER 76
                - Spike oblong.
                  - Spike erect to inclined.
                    - Plant early, midtall.
                      - Glumes midwide .... ZIMMERMAN 76
                      - Glumes wide .... WALKER 77
                    - Plant midseason, tall .... HARVEST QUEEN 77
                  - Spike nodding; plant midseason, midtall.
                    - Apical awns straight .... PROSPERITY 79
                    - Apical awns incurved .... FORWARD 80
                - Spike clavate.
                  - Spike middense .... SQUAREHEAD 80
                  - Spike dense.
                    - Blades midlong, midwide .... RED RUSSIAN 81
                    - Blades long, wide .... SOL 81

		Page.
1a. Spike Awnless—Continued.		
2a. Glumes Glabrous—Continued.		
3a. Glumes White—Continued.		
4b. Kernels Red—Continued.		
Kernels Short to Midlong—Continued.		
Kernels Soft to Semihard—Continued.		
Winter Habit—Continued.		
Stem purple.		
Spike fusiform.		
Spike erect	Oakley	82
Spike inclined to nodding	Wyandotte	82
Spike oblong.		
Spike dense, erect	Flint	82
Spike middense, erect to inclined.		
Plant midtall.		
Stem midstrong	Fultz	83
Stem strong	Ashland	85
Plant tall, stem strong	Trumbull	85
Spike clavate	Fultzo-Mediterranean	85
Spring Habit.		
Stem white; spike oblong, erect	Kinney	87
Stem purple.		
Spike fusiform, nodding	Purplestraw	87
Spike oblong, erect	Huston	88
Kernels Semihard to Hard.		
Winter Habit.		
Plant midseason	Alton	89
Spring Habit.		
Stem white.		
Spike fusiform.		
Plant early, short to midtall.		
Apical awns wanting	Red Bobs	89
Apical awns few, 1–10 mm. long	Marquis	90
Plant midseason, midtall to tall.		
Spike dense, erect, short	Red Fife Power	92 93
Spike middense, inclined, midlong.	Glyndon Rysting	93 94
Spike lax, inclined, long	Wellman	94
Spike oblong, middense, erect; plant early, midtall	Early Red Fife	95
Stem purple.		
Spike fusiform; plant early	Ghirka	95
Spike oblong.		
Plant early, short	Ruby	96
Plant midseason, midtall	Kitchener	96
Kernels Midlong to Long.		
Kernels Soft to Semihard.		
Winter Habit	Climax	97
3b. Glumes Brown.		
4a. Kernels White (*T. v. alborubrum* Kcke.).		
Kernels Short to Midlong.		
Kernels Soft to Semihard.		
Winter Habit.		
Stem white.		
Spike fusiform	Kofod	98
Spike oblong.		
Spike inclined; kernels soft	Dawson Honor	98 99
Spike nodding; kernels semihard	Schonacher	99
Spike clavate	Arcadian	99
Stem purple.		
Spike oblong, nodding	Windsor	100
Spike clavate, erect	Goldcoin	100
Spring Habit.		
Spike fusiform.		
Plant early	John Brown	102
Plant late	Allen	103

		Page.
1a. Spike Awnless—Continued.		
2a. Glumes Glabrous—Continued.		
3b. Glumes Brown—Continued.		
4a. Kernels White—Continued.		
Kernels Short to Midlong—Continued.		
Kernels Soft to Semihard—Continued.		
Spring Habit—Continued.		
Spike oblong	Federation	103
Spike clavate	Foisy	103
Kernels Semihard to Hard.		
Spring Habit	Hard Federation	104
4b. Kernels Red (*T. v. miltura* Al.).		
Kernels Short to Midlong.		
Kernels Soft to Semihard.		
Winter Habit.		
Stem white.		
Spike fusiform.		
Plant early	Gold Drop	105
Plant midseason.		
Spike inclined	Homer	105
Spike nodding.		
Plant midtall.		
Spike wide	Red Wave	105
Spike midwide	Fleming	106
Plant tall	Peterson	106
Plant late	Odessa	107
Spike oblong.		
Spike erect to inclined	Ruddy	108
Spike nodding	Rupert	108
Spike clavate.		
Plant early, short	Rural New Yorker No. 6	109
Plant late, midtall	Squareheads Master	110
Stem purple.		
Spike fusiform.		
Plant early to midseason.		
Spike inclined, narrow	Currell	110
Spike nodding, wide.		
Plant short	Winter Chief	111
Plant midtall.		
Beaks 0.5 mm. long.		
Stem midstrong	Poole	113
Stem strong	Portage	113
Beaks 1–1.5 mm. long	Russian Red	112
Plant late, tall	China	114
Spike oblong, erect.		
Shoulders wanting to narrow, oblique	Wheedling	115
Shoulders wide, square.		
Plant midseason	Red May	115
Plant late	Illini Chief	117
Spike clavate.		
Spike middense, inclined	Red Clawson	118
Spike dense, erect	Rochester	119
	Red Chief	119
Spring Habit.		
Stem white	Schlanstedt	119
Stem purple	Resaca	120
Kernels Semihard to Hard.		
Spring Habit.		
Stem white, spike fusiform	Stanley	120
2b. Glumes Pubescent.		
3a. Glumes White.		
4a. Kernels White (*T. v. leucospermum* Kcke.)		
Kernels Short to Midlong.		
Kernels Soft to Semihard.		
Winter Habit.		
Spike clavate	Silvercoin	120

1a. Spikes Awnless—Continued.
2b. Glumes Pubescent—Continued.
3a. Glumes White—Continued.
4a. Kernels White—Continued.
Kernels Short to Midlong—Continued.
Kernels Soft to Semihard—Continued.
Spring Habit.
Spike oblong. Page.
Beaks 0.5 mm. long, obtuse.............Jumbuck.................. 121
Beaks 1-2 mm. long, acuminate.........Indian.................. 121
4b. Kernels Red (*T. v. villosum* Al.).
Kernels Short to Midlong.
Kernels Soft to Semihard.
Winter Habit.
Spike inclined; kernels semihard.
Germ small; cheeks rounding............Triplet.................. 121
Germ midlarge; cheeks angular..........Mealy.................. 122
Spike nodding; kernels soft..................Jones Fife.................. 123
Kernels Semihard to Hard.
Spring Habit...Haynes Bluestem........ 124
Dakota.................. 126
3b. Glumes Brown.
4a. Kernels White (*T. v. delfii* Kcke.).
Kernels Short to Midlong.
Kernels Soft to Semihard.
Spring Habit.
Spike fusiform, beaks obtuse...............Galgalos.................. 126
Spike oblong, beaks acuminate.............Sonora.................. 126
4b. Kernels Red (*T. v. pyrothrix* Al.).
Kernels Short to Midlong.
Kernels Soft to Semihard.
Winter Habit; spike clavate....................Grandprize.................. 127
1b. Spike Awned.
2a. Glumes Glabrous.
3a. Glumes White.
4a. Kernels White (*T. v. graecum* Kcke.).
Kernels Short to Midlong.
Kernels Soft to Semihard.
Winter Habit.
Stem white.
Spike fusiform..........................Democrat.................. 128
Spike clavate.
Kernels small; beaks 3-20 mm. long..............................Seneca Chief.............. 128
Kernels midsize; beaks 2-10 mm. long..............................Oatka Chief.............. 128
Stem purple; spike clavate....................Mammoth Amber......... 129
Spring Habit.
Stem white..Palisade.................. 129
Stem purple..Propo.................. 130
Kernels Midlong to Long.
Kernels Soft to Semihard.
Winter Habit..Treadwell.................. 130
Spring Habit..Baart.................. 131
Kernels Semihard to Hard.
Spring Habit..Talimka.................. 132
4b. Kernels Red (*T. v. erythrospermum* Kcke.).
Kernels Short to Midlong
Kernels Soft to Semihard.
Winter Habit.
Stem white.
Plant early..Nebraska No. 28.......... 132
Plant midseason.
Plant midtall.
Beaks 1-3 mm. long............Gladden.................. 133
Beaks 2-10 mm. long...........Gipsy.................. 133

1b. SPIKE AWNED—Continued.
  2a. GLUMES GLABROUS—Continued.
    3a. GLUMES WHITE—Continued.
      4b. KERNELS RED—Continued.
        KERNELS SHORT TO MIDLONG—Continued.
          KERNELS SOFT TO SEMIHARD—Continued.
            WINTER HABIT—Continued.
              Stem white—Continued.
                Plant midseason—Continued. Page.
                  Plant tall.......... VALLEY.......... 134
                  WISCONSIN PEDIGREE NO. 40. 135
                Plant late.......... SIBLEY.......... 135
              Stem purple.
                Spike fusiform.......... FULCASTER.......... 135
                MAMMOTH RED.......... 138
                Spike clavate.......... DIAMOND GRIT.......... 139
                GOLDEN CROSS.......... 139
            SPRING HABIT.
              Beaks 1–2 mm. long.......... CHAMPLAIN.......... 139
              Beaks 1–15 mm. long.......... JAVA.......... 140
              Beaks 3–25 mm. long.
                Plant short, early.......... ERIVAN.......... 141
                Plant tall, midseason.......... CONVERSE.......... 142
          KERNELS SEMIHARD TO HARD.
            WINTER HABIT.
              Kernels semihard.
                Glumes white to yellowish.
                  Beaks 1–3 mm. long.
                    Plant midseason.......... MINTURKI.......... 142
                    Plant late.......... HUSSAR.......... 142
                  Beaks 2–8 mm. long.......... PESTERBODEN.......... 143
                Glumes often black striped.......... BLACKHULL.......... 143
              Kernels hard.
                Beaks 2–8 mm. long.......... TURKEY.......... 144
                IOWA NO. 404.......... 147
                IOWA NO. 1946.......... 147
                MONTANA NO. 36.......... 148
                NEBRASKA NO. 60.......... 148
                WISCONSIN PEDIGREE NO. 2. 148
                Beaks 3–25 mm. long.......... KANRED.......... 148
                BELOGLINA.......... 149
                BACSKA.......... 149
            SPRING HABIT.
              Stem white; plant midseason.
                Beaks 1–2 mm. long.......... PRESTON.......... 150
                Beaks 2–20 mm. long.......... KOTA.......... 152
              Stem purple; plant early; beaks 1–5 mm. long.......... PIONEER.......... 152
        KERNELS MIDLONG TO LONG.
          KERNELS SOFT TO SEMIHARD.
            WINTER HABIT.
              Stem white.
                Spike inclined; glumes black striped... RUDY.......... 153
                Spike nodding.......... GLUTEN.......... 154
              Stem purple.
                Beaks 1–2 mm. long.......... NIGGER.......... 154
                Beaks 2–10 mm. long.......... SILVERSHEAF.......... 155
            SPRING HABIT.
              Beaks 2–15 mm. long.......... FRETES.......... 155
              Beaks 5–30 mm. long.......... DIXON.......... 156
          KERNELS SEMIHARD TO HARD.
            SPRING HABIT; beaks 5–45 mm. long.......... CHUL.......... 156
  3b. GLUMES BROWN.
    4a. KERNELS WHITE (*T. v. erythroleucon* Kcke.).
      KERNELS SHORT TO MIDLONG.
        KERNELS SOFT TO SEMIHARD.
          WINTER HABIT.......... LINK.......... 157
          SPRING HABIT.......... EMERALD.......... 157

- 1b. Spike Awned—Continued.
  - 2a. Glumes Glabrous—Continued.
    - 3b. Glumes Brown—Continued.
      - 4a. Kernels White—Continued.
        - Kernels Short to Midlong—Continued.
          - Kernels Semihard to Hard. Page.
            - Winter Habit.......... Genesee Giant.......... 157
            - Spring Habit.......... Canadian Red.......... 158
        - Kernels Midlong to Long.
          - Kernels Soft to Semihard.
            - Winter Habit.
              - Stem white.......... Longberry No. 1.......... 159
              - Stem purple.......... New Amber Longberry.. 159
          - Kernels Semihard to Hard.
            - Spring Habit.......... Sevier.......... 159
      - 4b. Kernels Red (*T. v. ferrugineum* Al.).
        - Kernels Short to Midlong.
          - Kernels Soft to Semihard.
            - Winter Habit.
              - Spike fusiform.
                - Stem white.
                  - Beaks 1–5 mm. long.
                    - Plant midseason, tall.......... Diehl-Mediterranean... 160
                    - Plant late, midtall.......... Russian.......... 161
                  - Beaks 3–25 mm. long.......... Imperial Amber.......... 162
                - Stem purple; beaks 1–3 mm. long.......... Goens.......... 162
              - Spike oblong; stem purple; beaks 1–10 mm. long.......... Cox.......... 163
          - Kernels Semihard to Hard.
            - Winter Habit.......... Yaroslav.......... 164
            - Spring Habit.
              - Stem white.
                - Beaks 1–2 mm. long.......... Huron.......... 164
                - Beaks 3–25 mm. long.......... Norka.......... 164
              - Stem purple.
                - Shoulders usually rounding.......... Ladoga.......... 165
                - Shoulders elevated.......... Laramie.......... 165
        - Kernels Midlong to Long.
          - Kernels Soft to Semihard.
            - Winter Habit.
              - Stem white.......... Ariette.......... 166
              - Stem purple.
                - Kernels soft; crease midwide, middeep.. Mediterranean.......... 166
                - Kernels semihard; crease wide, deep... Red Rock.......... 168
  - 2b. Glumes Pubescent.
    - 3a. Glumes White.
      - 4a. Kernels White (*T. v. meridionale* Kcke.).
        - Kernels Short to Midlong.
          - Kernels Soft to Semihard.
            - Winter Habit.
              - Spike oblong.......... Bearded Winter Fife.... 168
              - Spike clavate.......... Read.......... 168
      - 4b. Kernels Red (*T. v. velutinum* Al.).
        - Kernels Short to Midlong.
          - Kernels Soft to Semihard.
            - Winter Habit.......... Rural New Yorker No. 57.......... 169
Pride of Genesee.......... 169
Virginia.......... 170
          - Kernels Semihard to Hard.
            - Spring Habit.......... Prelude.......... 170
        - Kernels Midlong to Long.
          - Kernels Soft to Semihard.
            - Spring Habit.......... Humpback.......... 171
    - 3b. Glumes Brown.
      - 4a. Kernels Red (*T. v. barbarossa* Al.).
        - Kernels Short to Midlong.
          - Kernels Soft to Semihard.
            - Winter Habit.......... Penquite.......... 171

DESCRIPTIONS, HISTORY, DISTRIBUTION, AND SYNONYMY OF COMMON WHEAT VARIETIES.

WINTER BLUESTEM.

Description.—Plant winter habit, midseason, midtall; stem glaucous, white, strong; spike awnless, fusiform, middense, erect to inclined; glumes glabrous, yellowish white, midlong, wide; shoulders midwide, square to elevated; beaks midwide, obtuse, 0.5 to 1.5 mm. long, slightly incurved; apical awns few, 5 to 40 mm. long; kernels white, midlong to long, soft to semihard, elliptical to ovate; germ small; crease midwide, middeep; cheeks rounded; brush small to midsized, midlong.

Winter Bluestem has the hardy winter characteristics of Turkey, but lacks vigor and is usually a comparatively low yielder.

History.—This variety originated at the Washington Agricultural Experiment Station, Pullman, Wash., as the result of a cross between Turkey and Pacific Bluestem (*170*, p. 6). It was distributed for commercial growing by the Washington Agricultural Experiment Station from 1912 to 1914.

Distribution.—Grown in the State of Washington to a very limited extent.

MARTIN (MARTIN AMBER).

Description.—Plant winter habit, midseason, tall; stem white, strong; spike awnless, linear-fusiform, lax, nodding; glumes glabrous, white, long, midwide; shoulders midwide, oblique to square; beaks wide, acute, triangular, 1.0 mm. long; apical awns few, 5 to 15 mm. long; kernels white, midlong, soft, ovate; germ small; crease midwide, middeep; cheeks rounded; brush midsized, midlong.

This variety is distinguished from other winter varieties of the group by its long, lax, tapering spike. A pure line (C. I. No. 4463) has been isolated which is resistant to bunt. A spike of Martin wheat is shown in Plate VI, Figure 2.

History.—Martin (Martin Amber) originated from a single plant found as a mixture in a field of Clawson by Henry S. Bunnell, of Junius, Seneca County, N. Y., about 1875 (*152*). Several names were early applied to it. It was called Armstrong by R. T. Halloway, of Penn Yan, Yates County, N. Y., who first distributed it in 1880 (*16*, p. 666). The variety, however, never became widely grown under that name. In 1882, J. A. Everitt, seedsman, of Watertown, Pa., named it Martin Amber and distributed it widely (*16*, p. 666). The variety became commercially established under that name. It was also distributed in 1882 as Landreth, by David Landreth & Son, seedsmen, of Philadelphia, Pa. (*152*).

Distribution.—Grown to a limited extent as Martin Amber in Arizona, Idaho, Illinois, Michigan, Ohio, Oregon, Pennsylvania, Utah, and Washington, and under the names of synonyms in Kentucky, Missouri, New York, North Carolina and Tennessee. The distribution of Martin wheat is shown in Figure 19.

Synonyms.—Amber, Armstrong, Landreth, Satisfaction, Silver Chaff, and White Amber. Amber and White Amber are local names used for the variety on farms in Idaho and Washington. The name White Amber is also used in Marion County, Ky. Armstrong and Landreth, as indicated above, are names given it by seedsmen many years ago, but are not now in use. Satisfaction is the name under which a similar wheat was obtained by the United States Department of Agriculture, but this was evidently wrongly labeled and the name should not be used for this variety. Silver Chaff is an old name for the variety (*15*) and was early recognized by the Ohio Agricultural Experiment Station as a synonym for Martin (Amber) (*116*). The variety is still grown under this name in Kentucky, Michigan, Missouri, New York, North Carolina, Ohio, and Tennessee.

PROHIBITION.

Description.—Plant winter habit, midseason to late, midtall to tall; stem glaucous, white, strong; spike awnless, linear-oblong to subclavate, middense, erect to inclined; glumes glabrous, white, midlong, wide; shoulders narrow to midwide, oblique to rounded; beaks wide, obtuse, 0.5 to 1.0 mm. long; apical awns few, 1 to 15 mm. long; kernels white, midlong, soft, ovate, humped; germ small; crease wide, middeep; cheeks rounded; brush small, midlong.

The distinctly humped kernels is a character which can be used to distinguish this variety from the other soft white wheats of the Pacific Northwest. Spikes, glumes, and kernels of this variety are shown in Plate VIII, *A*.

History.—B. H. Irvine, a pioneer in the Willamette Valley of Oregon, distributed the variety in that State. He obtained, through a Dr. Crawford, several varieties from the Commissioner of Agriculture for trial, about 1885, and grew them on his farm about 9 miles northeast of Scio, in Linn County. One variety proved superior to anything then grown in the vicinity. Having forgotten the name of the variety, he called it Prohibition, as he had just become an ardent member of that political party. Later he claimed to have found the descriptive sheet which accompanied the original seed and learned that the name was "Ricenbroad." A Rickenbrode wheat was reported as a new variety tested at Mount Pleasant, Ontario County, N. Y., in 1883 (*150*). It was distributed in the Western States by the Commissioner of Agriculture about 1885 and is without doubt the wheat referred to. Nothing further is known concerning its origin.

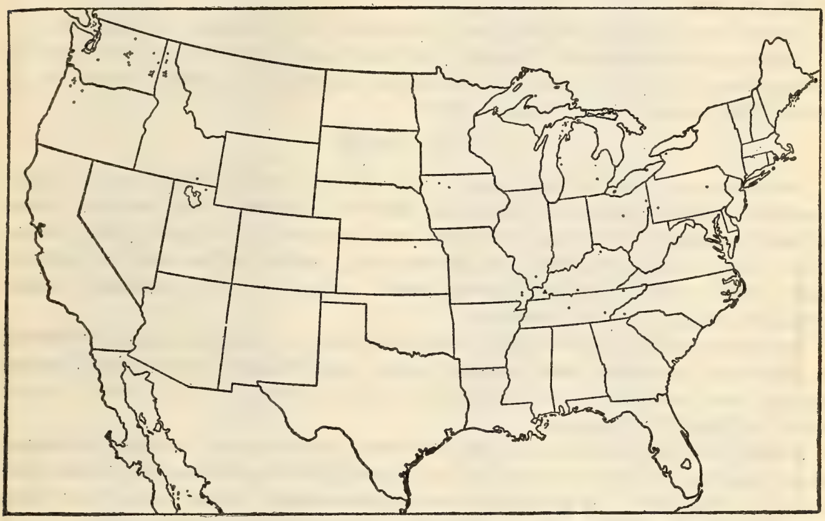


FIG. 19.—Outline map of the United States, showing the distribution of Martin wheat in 1919. Estimated area, 37,800 acres.

Distribution.—Grown in Linn and Marion Counties, Oreg., principally in the Red Hills section of the Willamette Valley.

Synonyms.—Prohi and Rickenbrode. Prohi is a colloquial shortening of the name of the variety, which recently has come into use for it in the Pacific Northwest. Rickenbrode apparently was the original name of the variety, but has not been used for many years.

GREESON.

Description.—Plant winter habit, midseason, midtall; stem glaucous, white, midstrong to strong; spike awnless, oblong-fusiform, middense, erect to inclined; glumes glabrous, white, midlong, wide; shoulders wide, square to elevated; beaks wide, obtuse, 1 mm. long; apical awns few, 2 to 20 mm. long, somewhat incurved; kernels white, midlong, soft, ovate, acute; germ midsized; crease midwide, deep; cheeks rounded, brush small, midlong.

The variety differs principally from Prohibition in being slightly earlier and in having slightly longer and laxer spikes and wider glumes and shoulders.

History.—According to W. H. McLean, of Whitsett, N. C., "this variety originated by a man whose name was Greeson, and has been grown in this country for a number of years and is very popular."[7] He reported that it constituted 40 per cent of the wheat grown near Whitsett, Guilford County, N. C., in 1919.

Distribution.—Grown in Chatham, Randolph, and Guilford Counties, N. C.

Synonym.—Greensboro. Because the seed was obtained at a fair held at Greensboro, N. C., this name is used for the variety in Randolph County, N. C., where this wheat is most widely grown.

WHITE WINTER.

Description.—Plant winter habit, late, midtall; stem white, strong; spike awnless, oblong, bluntish, dense, erect; glumes glabrous, white, midlong, broad at base; shoulders wanting to oblique; keel incurved above, beaks wide, obtuse, 1 mm. long; apical awns few, 3 to 20 mm. long; kernels white, short to midlong, soft, ovate, slightly humped; germ small; crease midwide, middeep; cheeks rounded; brush midsized, midlong.

The variety differs principally from Prohibition in being later and in having a distinctly incurved keel, smaller germ, and blunter kernel tip. Spikes, glumes, and kernels of this variety are shown in Plate VIII, *B*, and a single spike in Plate V, Figure 3.

History.—White Winter is one of the oldest wheats grown in western Oregon. It is reported to have been one of the principal wheats raised in Oregon Territory in 1855 (*97*). It probably is of English origin. Other names have been applied to the variety at times, but none has become generally used.

Distribution.—Grown in 10 counties of western Oregon and in Siskiyou County, Calif. It is one of the principal varieties grown in the Willamette Valley.

Synonyms.—Bishop's Pride, Oregon White, and Wold's White Winter. Bishop's Pride is, for the most part, White Winter. Dr. W. L. Bishop, of Dundee, Yamhill County, Oreg., claims he originated it as a result of a hybrid obtained by sowing several varieties in a field and letting them cross naturally. Oregon White is a name commonly used by farmers in the Willamette Valley of Oregon for the White Winter variety. Wold's White Winter is a name under which the variety is known in Washington County, Oreg. Joseph Connell, of Hillsboro, Oreg., reported in the Wheat Varietal Survey of 1917 that Wold's White Winter originated in Kent County, England, and had been grown in Washington County for about 40 years.

CHALLENGE (WEBB'S CHALLENGE WHITE).

Description.—This variety is similar to White Winter except that it is slightly taller and has a slightly longer spike, which tapers abruptly at the apex instead of being nearly blunt.

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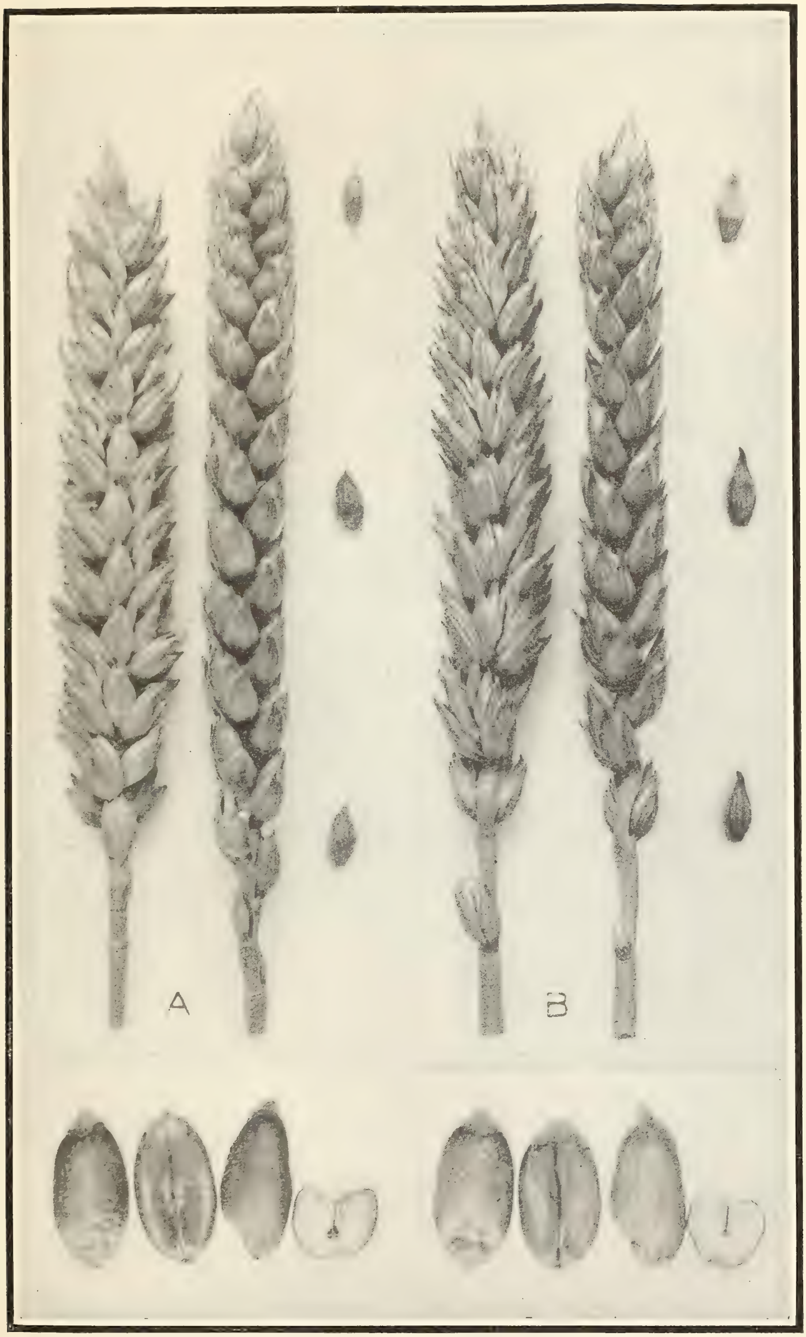
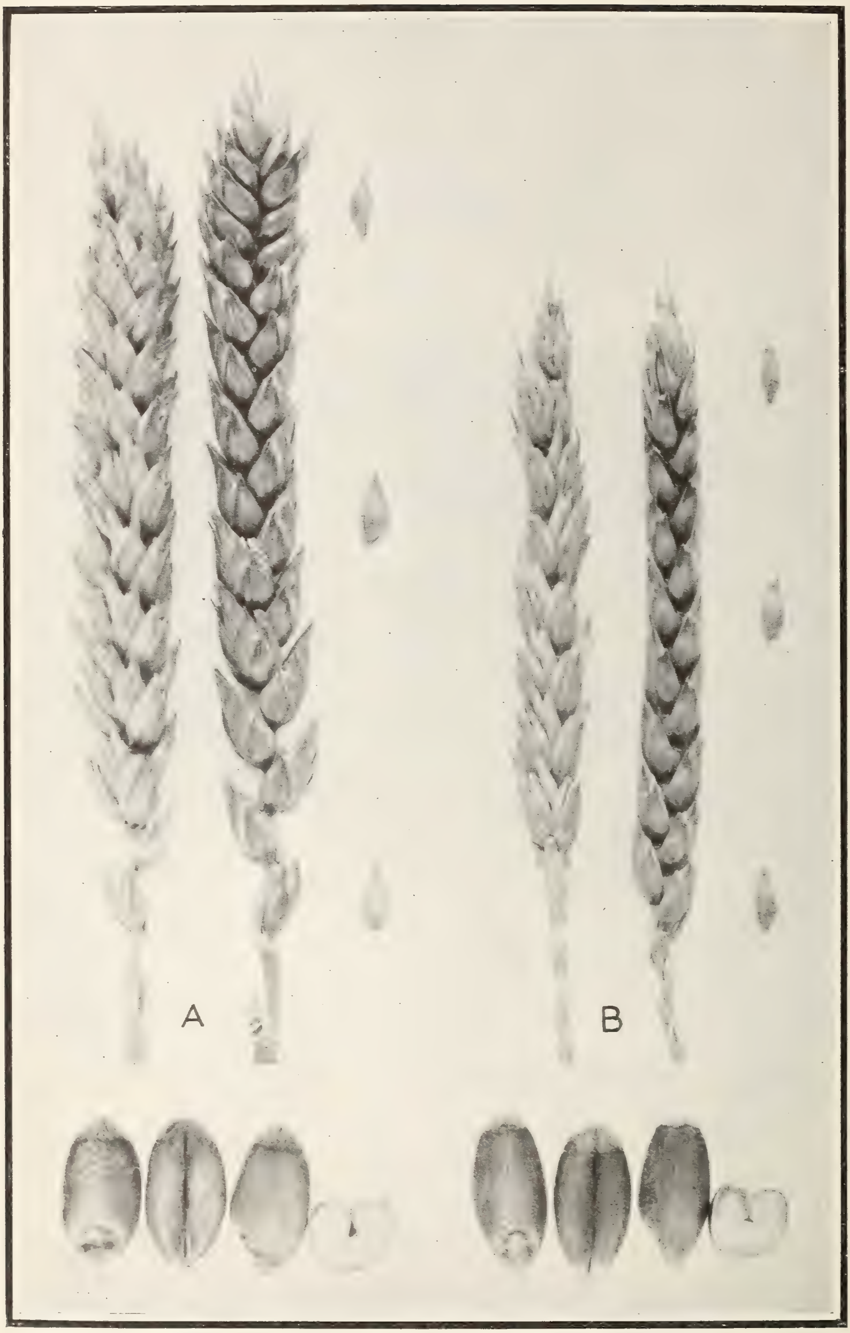
[7] Letter from W. H. McLean, dated July 19, 1919, on file in the Office of Cereal Investigations.



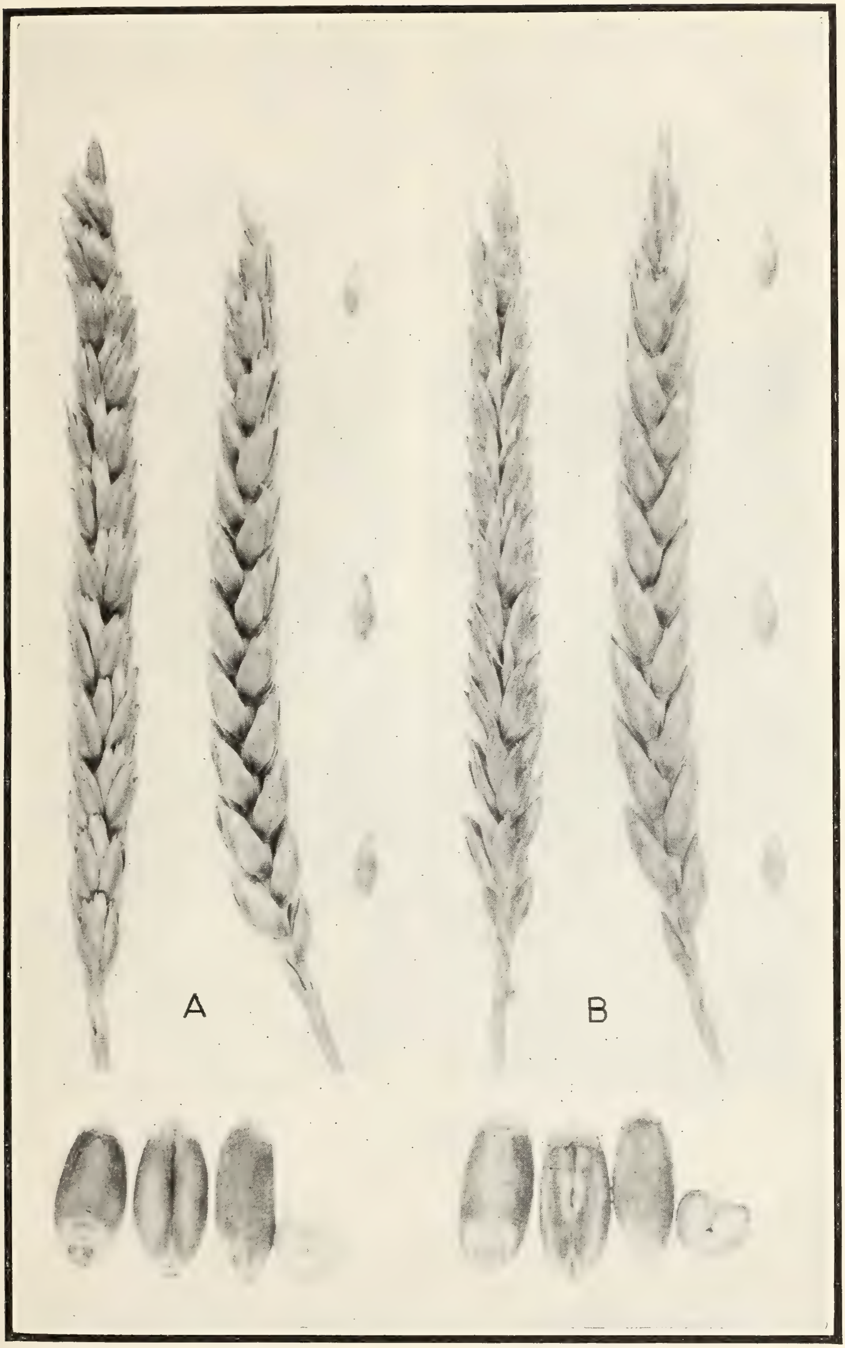
PROHIBITION (A). WHITE WINTER (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



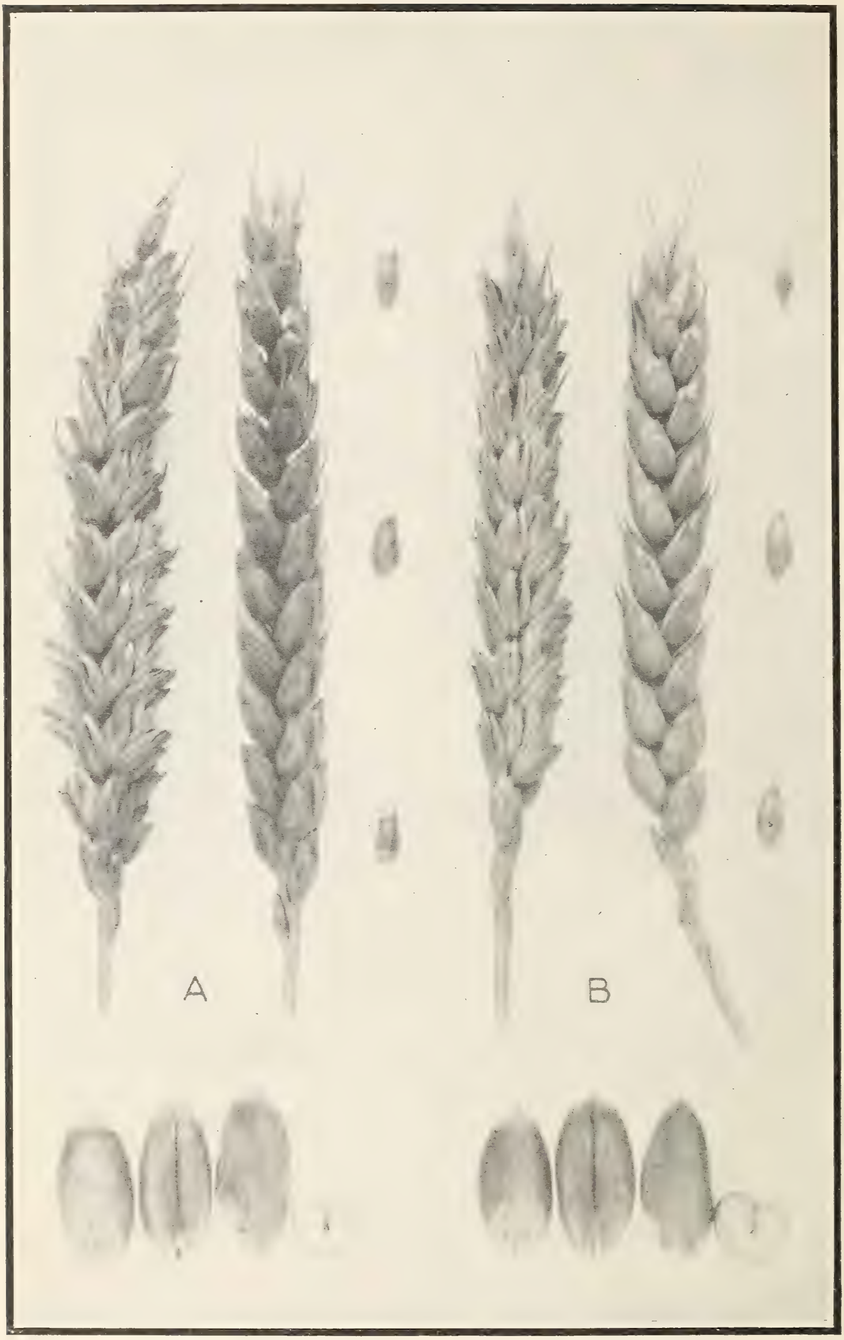
EATON (A). COLORADO NO. 50 (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



TOUSE (A). DEFIANCE (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



PACIFIC BLUESTEM (A). GYPSUM (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

History.—Challenge (Webb's Challenge White) is a selection from the White Victoria wheat of England (*133*, p. 220) made by Mr. Webb, of the Webb Seed Co., Wordsley, Stourbridge, England. The details of the introduction of this variety into the United States are not known.

Distribution.—Grown experimentally by the Oregon Agricultural Experiment Station. It is not known to be commercially grown in the United States.

EATON.

Description.—This variety is similar to both White Winter and Challenge, differing only in having the spike slightly clavate rather than oblong. Spikes, glumes, and kernels of Eaton wheat are shown in Plate IX, *A*.

History.—The origin of Eaton wheat is undetermined. It is thought by the writers to be an old variety of English origin. It has been grown by the Oregon Agricultural Experiment Station since 1894.

Distribution.—Grown in Idaho County, Idaho, and in Clackamas, Columbia, and Multnomah Counties, Oreg.

WHITE WONDER.

Description.—Plant winter habit, midseason, midtall; stem glaucous, white, midstrong; spike awnless, short, oblong, middense to dense, inclined to nodding; glumes glabrous, white, midlong, midwide; shoulders narrow, oblique to square; beaks wide, obtuse, 1 mm. long; apical awns several, 2 to 20 mm. long; kernels white, short, soft, oval to ovate; germ small to midsized; crease midwide, middeep; cheeks rounded; brush midsized, midlong.

This variety differs from Greeson principally in having spikes inclined or nodding rather than erect and glumes with much narrower shoulders.

History.—The origin of this variety is undetermined. A sample was obtained from Clark Sprigg, of Walkersville, W. Va., who reported that it made up 25 per cent of the wheat grown in his vicinity in Lewis County in 1919.

Distribution.—Grown in Lewis County, W. Va., and in Oneida County, N. Y.

SATISFACTION (SMITH'S RUST PROOF).

Description.—Plant winter habit, midseason, midtall; stem white, midstrong; spike awnless, clavate, middense, inclined; glumes glabrous, white, midlong, narrow to midwide; shoulders narrow, oblique to square; beaks wide, obtuse, 1.0 mm. long; apical awns several, 5 to 15 mm. long; kernels white, short to midlong, soft, oval to ovate; tips often nearly truncate; germ midsized; crease wide, middeep; cheeks angular; brush midsized, midlong.

Satisfaction is distinct in having a clavate spike. A spike of it is shown in Plate IV, Figure 3, and in Plate V, Figure 5.

History.—The origin of Satisfaction is undetermined. It was grown by the Ohio Agricultural Experiment Station at Wooster, Ohio, in 1904 (*204*, p. 38). A similar variety called Smith's Rust Proof was grown by the Ohio Agricultural Experiment Station as early as 1895 (*115*, p. 22).

Distribution.—Both Satisfaction and Smith's Rust Proof are grown at several experiment stations in the eastern United States. Neither is definitely known to be grown commercially, although Rust Proof was reported as a variety grown in Michigan, North Carolina, South Carolina, Tennessee, and Texas. All samples obtained from these sources, however, proved to be other varieties.

Synonym.—Smith's Rust Proof. The origin of this variety or name is undetermined. As indicated above, it is an older wheat than Satisfaction, and the extent of its present commercial culture, if any, is uncertain.

EARLY DEFIANCE.

Description.—Plant spring habit, early, short to midtall; stem white, midstrong; spike awnless, fusiform to oblong, middense, erect; glumes glabrous, white, midlong, midwide; shoulders narrow to midwide, oblique to square; beaks wide, triangular, acute, 0.5 to 1.5 mm. long; apical awns wanting to few; kernels white, midlong, soft to semihard, ovate to elliptical, germ usually small; crease midwide, middeep; cheeks usually rounded; brush midsized, midlong.

The variety differs from Defiance in being a week to 10 days earlier and in having kernels slightly longer and more pointed.

History.—This is a strain of Defiance wheat recently distributed by the Germain Seed Co., of Los Angeles, Calif.

Distribution.—Grown in San Diego County, Calif.

COLORADO NO. 50.

Description.—This variety is similar to Early Defiance except that it has several apical awns which vary from 2 to 15 mm. long. Spikes, glumes, and kernels of Colorado No. 50 are shown in Plate IX, *B*.

History.—This is a strain of Defiance wheat developed at the Colorado Agricultural Experiment Station. It was first distributed about 1909 or 1910 by Prof. W. H. Olin, then of that station. The Barteldes Seed Co., of Denver, Colo., later distributed the variety, recommending it for growing at altitudes of 8,000 feet or more (*45*).

Distribution.—Grown in Rio Grande County, Colo. It is said by the Barteldes Seed Co. to be grown in the higher elevations in Rio Grande and Routt Counties and in the San Luis Valley.

TOUSE.

Description.—Plant spring habit, midseason, midtall; stem white, slender, weak; spike awnless, fusiform, middense, erect to inclined; glumes glabrous, white, midlong, narrow to midwide; shoulders narrow, oblique to square; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns usually wanting; kernels white, midlong, soft, ovate to nearly elliptical; germ usually small; crease narrow to midwide, middeep; cheeks rounded; brush small, midlong.

This variety is not vigorous, has a very weak stem, and shatters readily. It has continued in cultivation partly as a mixture with club wheat which prevents lodging, many growers stating they grow Club and Touse. Spikes, glumes, and kernels of Touse wheat are shown in Plate X, *A*.

History.—Touse is an old wheat of Idaho and Utah. It was reported grown in Utah as early as 1870. The origin of Touse wheat is not definitely determined, but it is thought by the writers to be the Touzelle wheat which was introduced by the Federal Government from Marseille, France, the record of which was as follows:

> There have been two importations—one of 140 bushels in August, 1869, and one of 123 bushels in January, 1870. A small distribution was made in September, 1869, chiefly through Senators and Representatives in Congress (*8*, pp. 128–129).

Distribution of this variety by the Federal Government continued for several years. In the early seventies reports of the variety were received from several sections of the United States. It was distributed as a winter wheat, and reports from the Eastern States show that it did not prove sufficiently hardy for those sections, while in California, Colorado, and Oregon the reports indicated that it was grown successfully.

Distribution.—Grown sparingly in Arizona, Idaho, Montana, Nevada, Utah, and Wyoming.

Synonym.—White Touse. This name is used by some growers in Utah, Idaho, and Wyoming.

DEFIANCE.

Description.—Plant spring habit, midseason, tall; stem white, weak to midstrong; spike awnless, fusiform, middense, erect to inclined; glumes glabrous, white, midlong, narrow; shoulders narrow, oblique to square; beaks wide, obtuse, somewhat incurved, 1.0 mm. long; apical awns wanting to few, 3 to 12 mm. long; kernels white, midlong, soft, ovate; germ usually small; crease wide, middeep; cheeks usually angular; brush midsized, midlong.

Defiance wheat is variable in many of the characters above described, indicating that there are several different strains within the variety. Spikes and kernels of this wheat are shown in Plate X, *B*.

History.—Defiance is the result of a cross of White Hamburg as the male parent and Golden Drop as the female parent, which was made by Cyrus G. Pringle, in the Champlain Valley, near Charlotte, Vt., in 1871. It was first distributed in 1878 by B. C. Bliss & Sons, as Pringle's Defiance. It showed three distinct types of grain. Prof. A. E. Blount took some of this wheat to the Colorado Agricultural Experiment Station, where he grew it during a number of years and made careful selections. Three commercial varieties were developed from it, viz, Early Defiance, Colorado No. 50, and Regenerated Defiance. Prof. A. H. Danielson, who succeeded Professor Blount at the Colorado station, has recorded the following interesting history of the origin of Defiance wheat:

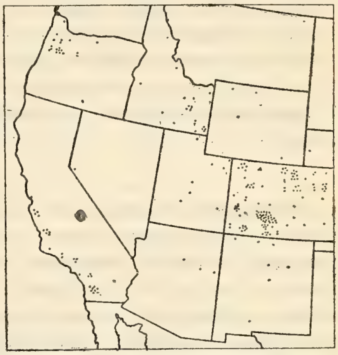


FIG. 20.—Outline map of the western United States, showing the distribution of Defiance and Regenerated Defiance wheat in 1919. Estimated area, 194,400 acres.

> Before closing I want to give a little résumé of the history of Colorado's most famous wheat. The mother of Defiance traces back to southern England and was originated by F. F. Hallett, of Brighton, in the sixties. He is the man who first used the word pedigree as applied to wheat. The mother was a decided club-shaped type with pretty red grain, somewhat soft, and Hallett called it the Golden Drop. It was quite popular in England, but never amounted to much either in this country or Australia. From England it went to Canada, where a man named Pringle got it as the Canada Club. The father of Defiance was a Dutchman from Germany, and rather soft at that, but white. It came from Hamburg, from whence lots of wheat emigrated in those days. It had a long, coarse broad head, a big white berry, and a rank-growing constitution with good ability to stand on its feet. Good old White Hamburg has long since been dead and buried to cultivation, at least under that name, but was largely grown on the Pacific slope during the early days of cereal culture there (76).

Distribution.—Grown from spring sowing mostly on irrigated land in Colorado, Idaho, Nebraska, Nevada, New Mexico, Utah, and Wyoming, and from fall sowing in western Oregon and southern Arizona and California. The distribution of Defiance and Regenerated Defiance wheat is shown in Figure 20.

Synonym.—Pringle's Defiance. As indicated above, this was the name under which the variety was first distributed by a seed company. In recent years the name Defiance has been generally used.

RINK.

Description.—Plant spring habit, midseason, midtall; stem white, strong; spike awnless, broadly fusiform, middense, inclined; glumes glabrous, yellowish white, midlong, midwide; shoulders wide, usually square; beaks wide, acute, curved, 1 to 1.5 mm. long; apical awns many, 2 to 10 mm. long, occurring nearly throughout the spike, and distinctly incurved; kernels white, short to midlong, soft, ovate, slightly humped; germ usually small; crease midwide, deep; cheeks rounded; brush midsized, midlong to long.

This variety is distinct in having incurved apical awns occurring nearly throughout the entire length of the spike. Spikes of Rink wheat are shown in Plate IV, Figure 4, and Plate V, Figure 2.

History.—The origin of Rink wheat is undetermined. It was reported to have been grown in Washington County, Oreg., since 1909.

Distribution.—Grown in Benton, Polk, Washington, and Yamhill Counties, Oreg.

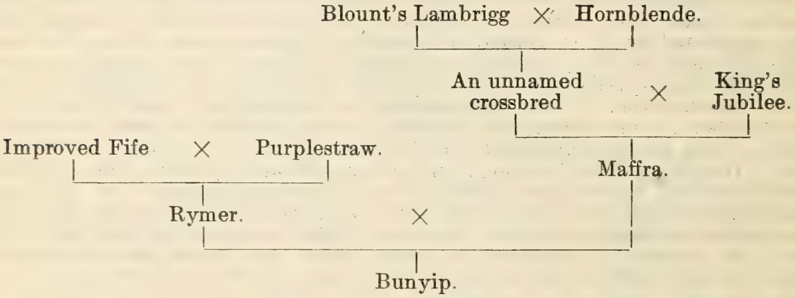
BUNYIP.

Description.—Plant spring habit, early, midtall; stem white, strong; spike awnless, oblong, dense, erect; glumes glabrous, yellowish white (brown striped), midlong, midwide; shoulders midwide, oblique to square; beaks narrow to midwide, acute, 0.5 mm. long; apical awns few, 3 to 12 mm. long; kernels white, midlong, soft to semihard, ovate; germ midsized; crease midwide, middeep; cheeks angular; brush midlong, midsized to large.

The glumes of this variety are distinctly brown striped, which sometimes gives the appearance of a brown-glumed variety.

History.—Bunyip is an Australian variety originated by William Farrer, the well-known plant breeder of New South Wales, Australia. Its origin has been recorded as follows:

> It is a crossbred, produced as the result of mating two other crossbreds, Rymer and Maffra, together. Rymer, the mother plant, was produced as the result of crossing Purplestraw on to Improved Fife, the latter being a Manitoba variety. Maffra was the product of King's Jubilee, mated with an unnamed crossbred (Blount's Lambrigg × Hornblende). Its pedigree is, therefore, as follows:


Blount's Lambrigg × Hornblende.
An unnamed crossbred × King's Jubilee.
Improved Fife × Purplestraw.
Maffra.
Rymer. ×
Bunyip.

The cross was made in 1897 and named in 1901 (*188*, p. 189).

Bunyip was first introduced into the United States (S. P. I. No. 38345) in May, 1914, by the United States Department of Agriculture (*197*). In 1915 a sample of the variety was included in the Australian exhibit at the Panama-Pacific International Exposition at San Francisco, Calif. A part of this seed was obtained, together with that of several other varieties, by the Sperry Flour

Co. and grown on their experiment station near Stockton, Calif. Of several varieties grown, the Bunyip was selected as the most promising and was increased and distributed for commercial growing in California.

Distribution.—Grown in San Joaquin and Stanislaus Counties, Calif.

PACIFIC BLUESTEM.

Description.—Plant spring habit, midseason, tall; stem white, strong; spike awnless, linear-oblong, dense, erect; glumes glabrous, yellowish white, sometimes becoming a light brown, midlong, wide; shoulders wide, square to elevated; beaks wide, oblong, obtuse to truncate, 0.5 to 1 mm. long; apical awns several, 8 to 20 mm. long; kernels white, midlong, soft to semihard, ovate, sometimes becoming oval; germ midsized; crease wide, middeep; cheeks usually angular; brush midsized, midlong.

This variety can be easily identified by its broad, square shoulders and broad, blunt beaks. The variety is a high-yielding wheat under favorable climatic conditions, and the grain is considered above the average in quality for bread making among the white-kerneled wheats grown in the Pacific Coast States. Spikes, glumes, and kernels of this wheat are shown in Plate XI, *A*, and a single spike in Plate VI, Figure 5.

History.—Pacific Bluestem is an old wheat of the Pacific coast area, most commonly known as Bluestem and White Australian. The variety came to America from Australia. White Lammas was the leading wheat variety of Australia during the earliest years of wheat production in that country. According to Cobb (*70*, p. 9), White Australian of California is identical with White Lammas of Australia. It apparently was introduced into the United States in the early fifties as White Australian or Australian. During the period from 1852 to 1866 (*179*, p. 176; *38*, p. 138; *84*, p. 586) its culture became established in California under the name White Australian. Since that time it has remained the principal variety grown in that State. Bluestem is the name under which the variety became established in Washington and Oregon. According to W. P. Church, of Walla Walla, Wash., the wheat known as Bluestem in that section came from two introductions, the first from Australia in 1882 and the second from New Zealand in 1896. The following item was recorded concerning the first introduction:

> Most of the wheat raised in that locality (Walla Walla County) is what is known as the Bluestem variety. It is an Australian wheat, introduced in this country by Sibson, Church & Co. George Delaney was the first to sow the wheat in this country in 1882, but W. H. Reed, of the firm of Reed & Co., grain merchants, was the first to bring it into general use (*21*).

Concerning the second introduction, Mr. Church has stated that "it consisted of 14 sacks and contained a mixture of 10 to 15 per cent of red kernels contained in bearded heads." Mr. Church stated further that the introductions came under the name of Purplestraw Tuscan. This name, however, was never used for the wheat in the United States. The wheat is not similar to the Purplestraw Tuscan wheat of Australia, but is somewhat similar to, but not identical with, the White Tuscan and Silver King varieties.

It is not known how the name "Bluestem" came to be applied to the variety, as it does not have the purple stem common to many varieties of wheat and is not similar to any of the other five varieties grown in the United States under that name. To distinguish this Bluestem wheat from the others it has recently been called Pacific Bluestem. In Washington and Oregon the Pacific Bluestem wheat became as popular as the White Australian did earlier in California, and until recent years it has been the principal spring wheat grown in the so-called "Inland Empire."

Distribution.—Grown as Bluestem in Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, and Washington. The distribution is shown in Figure 21.

Synonyms.—Australian, Bluestem, Chile, Palouse Bluestem, White Australian, White Bluestem, White Chile, White Elliott, and White Lammas.

As indicated above, Australian, Bluestem, White Australian, and White Lammas are old names for the variety in Australia and the United States. Palouse Bluestem and White Bluestem are names which more recently came into use for this variety to distinguish it from other bluestem wheats in the United States. Chile and White Chile are names which came into use for the variety because cargoes of this wheat were received from time to time from Chile and in part were used for seed. White Elliott is a local name used for this wheat in Douglas County, Wash.

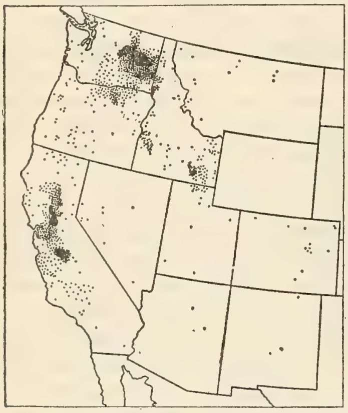


FIG. 21.—Outline map of the western United States, showing the distribution of Pacific Bluestem wheat in 1919. Estimated area, 1,363,400 acres.

MEXICAN BLUESTEM.

Description.—Mexican Bluestem is a variety similar to Pacific Bluestem, except that it is slightly shorter and earlier and has bronze rather than white to yellowish glumes. The glumes, however, never become dark enough to be classed as brown.

History.—Seed of this variety was obtained by the Washington Agricultural Experiment Station from Mexico. It was grown at the Western Washington Experiment Station, Puyallup, Wash., where it proved to be the best yielding spring wheat in a 6-year experiment and was distributed for commercial growing in the vicinity of that station. As it differed slightly from Pacific Bluestem and was a better yielder, a distinct name seemed necessary, and Mexican Bluestem was used to indicate its origin and its similarity to Pacific Bluestem.

Distribution.—Grown in Grays Harbor and Pierce Counties, Wash.

DART (DART'S IMPERIAL).

Description.—Plant spring habit, early to midseason, midtall; stem white to yellowish, strong; spike awnless, subclavate, middense, erect; glumes glabrous, white, midlong, midwide; shoulders narrow to midwide, oblique to square; beaks wide, obtuse, 1 to 2 mm. long; apical awns several, 3 to 20 mm. long; kernels white, midlong, soft to semihard, ovate, acute; germ small to midsized; crease midwide, shallow; cheeks rounded, brush small, midlong, collared.

History.—This is an Australian variety. Its origin is recorded by Richardson (*158*, p. 124) to be as follows:

> This popular variety was originated by Thomas Dart, of Nhill, Victoria, formerly of Lucindale, South Australia, and is a selection from a purple-straw variety. It is one of the oldest varieties in general cultivation at the present time.

The earliest introduction of this wheat into the United States is thought to have been in 1915, when it was included in the Australian exhibit of wheats at the Panama-Pacific International Exposition at San Francisco, Calif. At the close of the exposition, the Sperry Flour Co. obtained a part of the sample and grew it at their experiment station near Stockton, Calif., where it was later increased and distributed for commercial growing in the State.

Distribution.—Grown in San Joaquin County, Calif.

GYPSUM.

Description.—Plant spring habit, midseason, midtall; stem glaucous, white, strong; spike awnless, subclavate, middense, inclined; glumes glabrous, white, midlong, wide; shoulders wide, oblique to square; beaks wide, triangular, acute, 0.7 to 1.2 mm. long; apical awns several, 5 to 15 mm. long; kernels white, midlong, soft to semihard, ovate; germ midsized; crease midwide, middeep; cheeks usually angular; brush midsized, midlong.

This variety differs principally from Defiance in being shorter and in having shorter and broader subclavate spikes and broader glumes with squarer shoulders and longer beaks. The kernels have a distinctly rough coat. Spikes, glumes, and kernels of Gypsum are shown in Plate XI, *B*, and a single spike in Plate VI, Figure 6.

History.—Gypsum is recorded by Carleton (*58*, p. 83) as of hybrid origin. It was developed at the Colorado Agricultural Experiment Station, Fort Collins, Colo., during the eighties, by Prof. A. E. Blount. The variety became known in Australia as Blount's Lambrigg (*72*, p. 4; *61*, p. 219). During recent years, in the United States, the variety has been grown as Colorado Special, that name having been in use as early as 1912 on the Rexburg Bench, in southern Idaho.

Distribution.—Grown as Colorado Special in Madison, Teton, Franklin, Fremont, and Power Counties, Idaho.

Synonyms.—Blount's Lambrigg and Colorado Special.

SURPRISE (PRINGLE'S SURPRISE).

Description.—Plant spring habit, late, midtall; stem slightly glaucous before maturity, white, strong, coarse; leaves broad; spike awnless, clavate, dense, erect; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to square; beaks wide, obtuse, 1.0 mm. long; apical awns several, 3 to 15 mm. long; kernels white, short to midlong, soft, oval to ovate; germ small to midsized; crease wide, deep; cheeks rounded to angular; brush midsized, midlong.

This wheat varies somewhat from the preceding description. Several distinct types have been selected from it, and many more could be. Like Defiance, the variety probably was not pure when first distributed. It is a high-yielding wheat when grown under very favorable conditions and is well adapted for growing under irrigation.

History.—Surprise was originated by Cyrus G. Pringle, in the Champlain Valley, near Charlotte, Vt., in the late seventies. Concerning the origin of the variety, Mr. Pringle wrote the Rural New Yorker as follows:

> My No. 4 (thus numbered only in samples of wheat sent to Prof. Blount for trial) is a cross between the Chile Club, the soft, white variety, widely grown in the Pacific coast, and the Michigan Club, once common over our Northwestern States. Under the name of Pringle's Surprise, the entire stock was sold two or three years ago by my agent to the Commissioner of Agriculture, Le Duc, for distribution (*17*).

It evidently was widely distributed in several Western States in the eighties. It was advertised in California farm papers at that time, but with the decline of the wheat industry in that State the identity of the variety became lost. It later became known by several different names. In recent years it has been called California Gem in that State, while in Utah, where it is most widely grown, it is best known as California Club, although several other names have been used. The name Pringle's Surprise has continued in use in Grays Harbor County, Wash., where it was introduced about 1883.

Distribution.—Grown in California, Idaho, Oregon, Utah, Washington, and Wyoming, mostly under the synonyms here recorded. The distribution is shown in Figure 22.

Synonyms.—Australian Club, Bay, California Club, California Gem, Excelsior, Golden Gate Club, Imperial Club, Pride of California, Silver Chaff, Silver Club, Smith Club, University Gem, White Russian.

Australian Club is the name under which the variety is grown in Lane County, Oreg. Bay is a name used for the variety in Mendocino County, Calif. As stated above, California Club is the name under which the variety is best known, particularly in Utah. Although not a club wheat, this and other names ending in Club have been used for the variety for many years. The name Golden Gate Club is used in San Luis Obispo County, Calif., Imperial Club in Summit County, Utah, Silver Club in Duchesne County, Utah, and Smith Club in Lake County, Calif. In the last mentioned county the name Pride of California also is used for the variety.

California Gem is a name under which the variety has been grown and distributed by the California Agricultural Experiment Station since about 1899 (*28*). University Gem has also been used by the California Agricultural Experiment Station. The name Excelsior is in use for the variety in Salt Lake County and Silver Chaff in Morgan and other counties of Utah. One sample obtained under the latter name varied in having a less clavate spike, but was otherwise similar. White Russian is a name used for the variety by the Washington Agricultural Experiment Station.

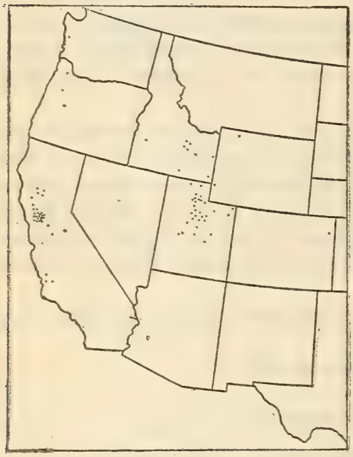


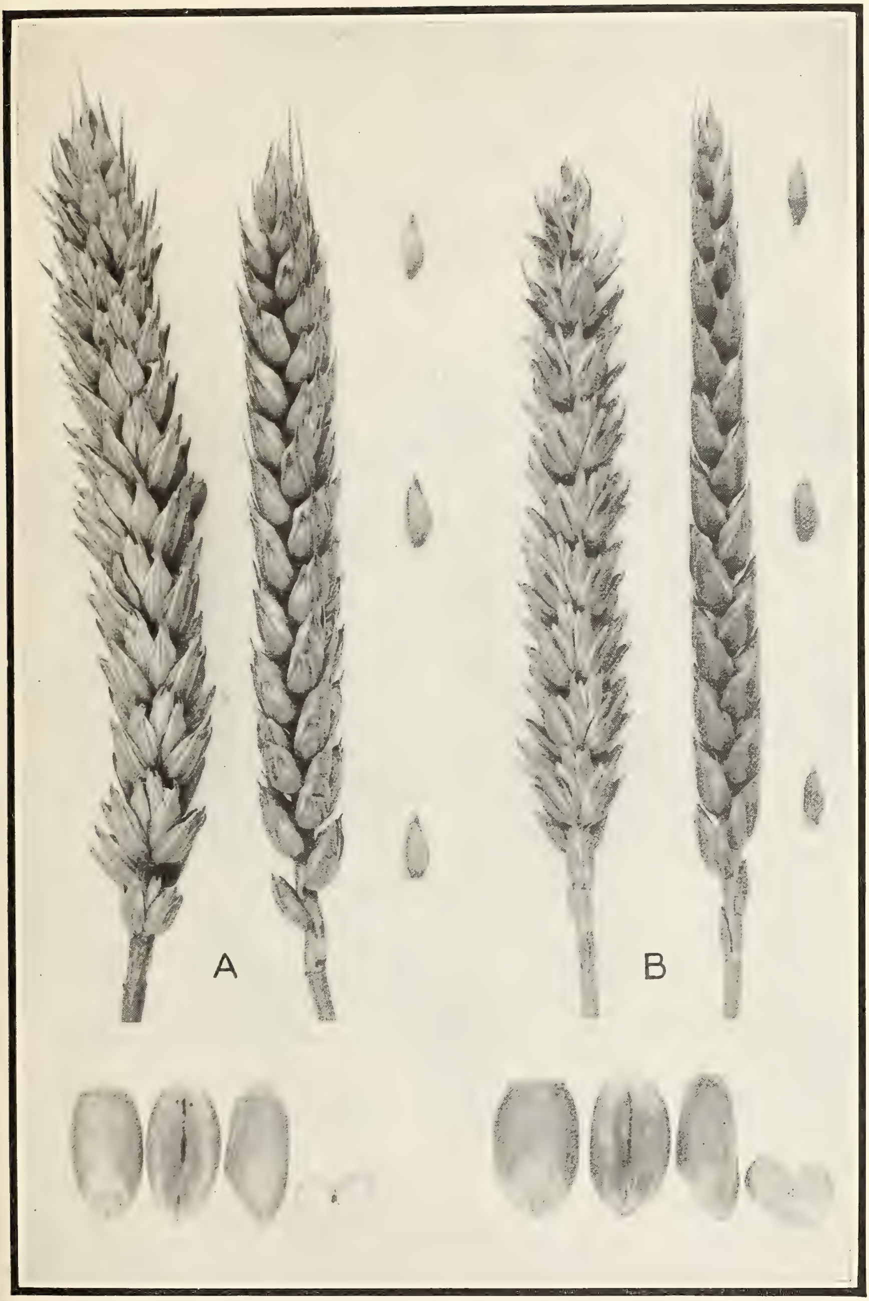
FIG. 22.—Outline map of the western United States, showing the distribution of Surprise wheat in 1919. Estimated area, 60,900 acres.

DICKLOW.

Description.—Dicklow differs from Surprise in having spikes slightly longer and laxer and stems and leaves much more glaucous during the heading and blossoming stages of growth. It is a high-yielding variety under irrigation, but will shatter badly if allowed to become overripe before harvest. Spikes, glumes, and kernels are shown in Plate XII, *A*.

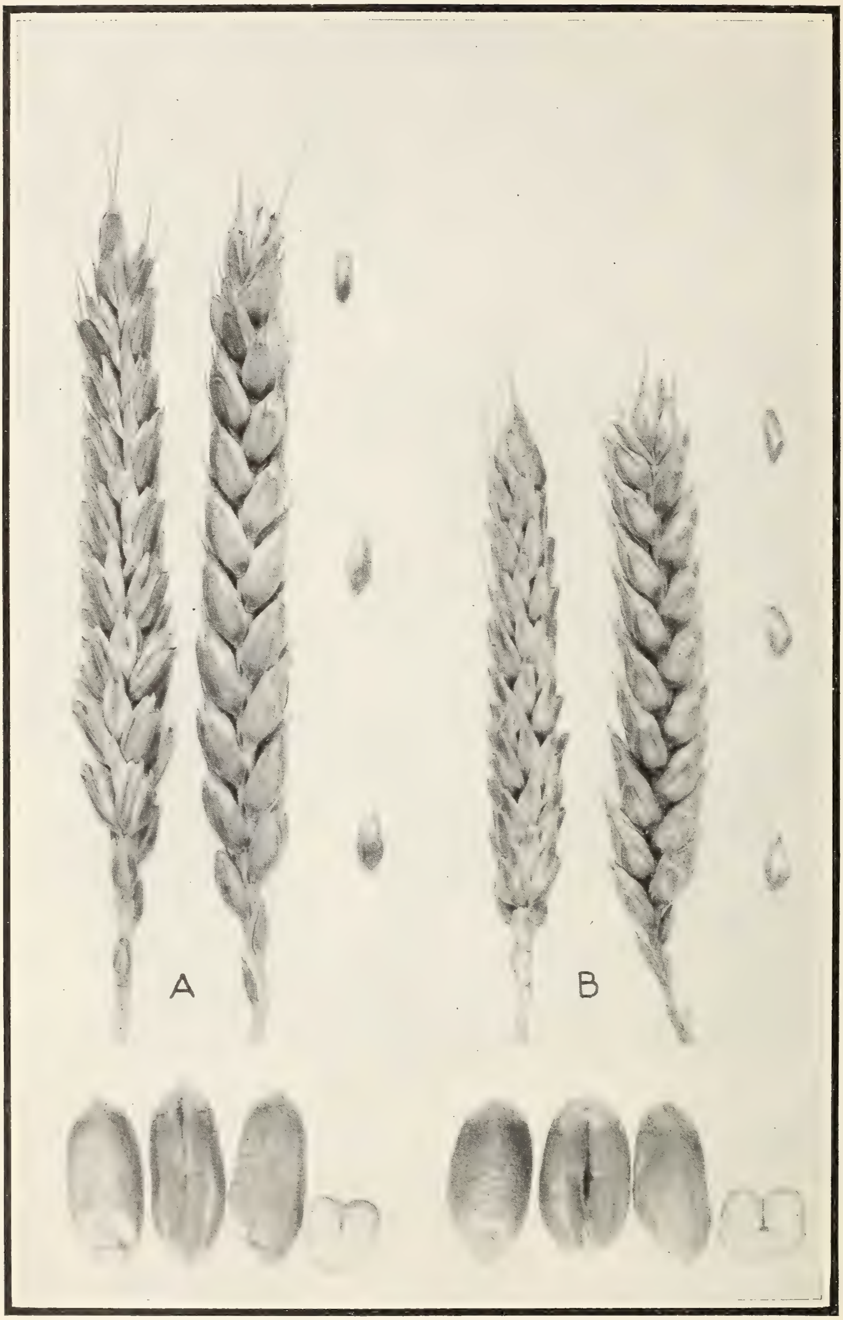
History.—Dicklow was developed by selection and its uniformity indicates that it is a pure line or nearly so. The origin of this strain of Surprise wheat has been recorded by Aicher (*34*, p. 20) as follows:

> Mr. James Holly, of Utah County, Utah, obtained some California Club wheat from northern California and seeded it on his farm. Excellent results were obtained, and he called the attention of his neighbor, Mr. Richard Low, to his new wheat. Mr. Low obtained some and grew it. He noticed that the wheat contained different types and proceeded to select the type which he liked best. He grew this selection for several years, and the neighbors soon began clamoring



DICKLOW (A). REGENERATED DEFIANCE (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



NEW ZEALAND (A). PILCRAW (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

for "Dick" Low's wheat. As the wheat became spread over that section of Utah, it lost its personal connection with "Dick" Low and became known simply as Dicklow wheat.

Distribution.—Grown in Idaho, Montana, Utah, and Wyoming. It is most widely grown under irrigation in southern Idaho, where it was introduced in 1912 and 1913. The distribution is shown in Figure 23.

Synonym,—Jim Holly. This name was used by some growers of Dicklow wheat when the strain was first being distributed, but it has since largely gone out of use.

BOBS.

Description.—Plant spring habit, early, midtall; stem white, strong; spike awnless, fusiform, middense, erect; glumes glabrous, white to yellowish, midlong, midwide; shoulders wide, square; beaks wide, acute, short, 0.3 mm. long, sometimes nearly wanting; apical awns wanting; kernels white, usually short, hard, oval to ovate, with truncate tip; germ midsized; crease midwide to wide, middeep to deep; cheeks angular, brush midsized, short.

The Bobs variety is distinct in having no apical awns and very short beaks. The kernels are hard and have a distinctly short brush. It usually is a comparatively low-yielding variety under favorable conditions, but under conditions of drought often will yield well in comparison with others. The flour from it is very strong, exceeding in bread-making value the other white-kerneled varieties grown in the United States. A spike of Bobs wheat is shown in Plate IV, Figure 1.

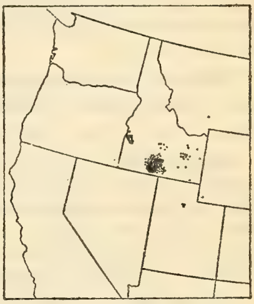


FIG. 23.—Outline map of the Pacific Northwest, showing the distribution of Dicklow wheat in 1919. Estimated area, 164,600 acres.

History.—The Bobs variety was originated by William Farrer, of New South Wales, Australia. It is reported to be the result of a hybrid between a barley and a wheat. Such a cross was never obtained by other workers and is now generally considered to be impossible. Furthermore, the original progeny showed no trace of barley characters. Considerable doubt, therefore, exists as to whether Mr. Farrer actually obtained a cross. The origin of Bobs as recorded in Australian literature is as follows:

> Bobs was produced in 1896 as a result of mating a variety of barley, called Nepaul or Bald Skinless barley, with a strain of Blount's Lambrigg wheat, which, for record purposes, was called M. (F.), but which became known later as Early Lambrigg. As the result of the artificial pollination effected, only one shrivelled grain was produced. This was planted, and very little difficulty was experienced in fixing a variety from it. Four years later the progeny of this cross had become fixed and was named Bobs.
>
> This variety is really a hybrid and not a crossbred, for it is the result of mating two distinct species, viz, a wheat and a barley, together. A crossbred is the result of mating two varieties of the same species together (*188*, p. 187).

Distribution.—Grown by experiment stations in the Pacific Coast States and commercially to a very small extent in San Luis Obispo and Monterey Counties, Calif.

QUALITY.

Description.—Plant spring habit, early, short to midtall; stem white, strong; spike awnless, fusiform, middense, erect; glumes glabrous, yellowish white, short, wide, easily shattered; shoulders wide, oblique to square; beaks wide, acute, 0.5 mm. long; apical awns few, 3 to 10 mm. long; kernels white, short to midlong, hard, oval; germ midsized; crease midwide, middeep to deep; cheeks rounded; brush midsized, midlong.

Quality is a spring wheat and is not winter hardy when fall sown. It also shatters very badly in dry climates.

History.—Quality wheat was first distributed by Luther Burbank, of Santa Rosa, Calif., in 1918. In his catalogue of "New Standard Grains" (*52*) in 1918, Mr. Burbank's first published statement concerning Quality wheat is as follows:

> This season I offer a superior early hard white wheat suited to all climates wherever wheat can be grown; as a summer wheat in the cold far northern climates and as a winter crop in the United States and most wheat-growing countries. It is especially adapted also to short seasons and soils and dry climates. A superior white milling wheat which makes the best light, sweet, nutritious bread and pastry. . . . This early, hardy "Quality" wheat which I offer this season will not yield as much as some of the coarse macaroni wheats in some warm, dry sections, but for general culture, with its unusual hardiness and extreme earliness, uniformity, superior milling and bread-making qualities, it stands alone. It most resembles in all these respects the hard northern wheat "Prize Marquis," but has a vitreous white berry of quite different appearance and quality and of about the same specific gravity as granite (*52*).

The seed was originally sold at $5 per pound, or $45 for 10 pounds, i. e., at the rate of $270 a bushel. Concerning these extravagant claims and prices, Buller (*50*, p. 235) has made the following comment:

> But Mr. Burbank is only just beginning his work as an introducer of new wheats, and the writer can not help feeling that in penning his advertisement of Quality he allowed his enthusiasm for his new cereal to be mixed a little too freely with his ink. . . . When Mr. Burbank tells us that Quality . . . . has kernels with about the same specific gravity as granite, surely he is addressing us in the language of hyperbole.

Distribution.—Grown experimentally and to a small extent commercially in California, Montana, and Oklahoma, in 1920.

WHITE FIFE.

Description.—Plant spring habit, midseason, midtall; stem white, midstrong; spike awnless, fusiform, middense, erect; glumes glabrous, white to yellowish, short, midwide, shoulders midwide, oblique to square; beaks midwide, acute, 0.5 to 1.0 mm. long; apical awns few, 5 to 15 mm. long; kernels white, short to midlong, hard, ovate; germ midsized; crease midwide, middeep; cheeks angular; brush midsized, midlong. A spike of this wheat is shown in Plate IV, Figure 2.

History.—White Fife is thought to be a white-kerneled separation from the well-known Red Fife wheat of Canada, although its exact origin is undetermined. It was grown by the Colorado Agricultural Experiment Station in 1879 from seed obtained from Minnesota (*46*, p. 40). It was first grown in the varietal experiments at Indian Head, Saskatchewan, Experimental Farm in 1889, where it was continued in the experiments until 1911. During this 23-year period it outyielded Red Fife by nearly 1.5 bushels per acre. The variety was used by Dr. A. P. Saunders as one of the parents of crosses from which originated the varieties Huron, Percy, and Prelude. The White Fife variety was used also by Prof. A. E. Blount as a parent stock for several of his hybrids made at the Colorado Agricultural College about 1888.

Distribution.—Grown sparingly in Polk County, Minn., Sheridan County, Nebr., and Richland County, N. Dak. It was reported in 1904 to have been grown to a considerable extent in some parts of Manitoba and the Northwest Territories.

WHITE FEDERATION.

Description.—Plant spring habit, early, short to midtall; stem white, strong, spike awnless, oblong, middense, erect; glumes glabrous, white, short, wide; shoulders wide, square; beaks narrow, acute, 0.5 mm. long; apical awns wanting or nearly so; kernels white, short, semihard to hard, ovate, with truncate tip; germ midlarge; crease midwide, middeep; cheeks rounded; brush midsized, midlong.

This variety is very similar to Hard Federation, except that it has white instead of brown glumes. The plant also is slightly taller and the kernels are not quite as hard. It has proved to be a high-yielding wheat in California and Oregon.

History.—White Federation is of Australian origin, but as far as the writers are aware its history has never been recorded in Australian literature. The following sentence, however, indicates its origin:

> The seed (hard kernels selected from Federation by Mr. J. T. Pridham, from which Hard Federation originated) was propagated, and in 1910 the occurrence of white heads was noticed, and from then until 1912 distinctly white heads were common among the brown (*30*, p. 664).

The name White Federation has been used for the wheat at the Cowra Experiment Farm, New South Wales, Australia, since 1915, when a field of 3 acres of the variety was grown (*154*).

It was introduced into the United States by the United States Department of Agriculture (*197*) in 1916 (S. P. I. No. 42104), when 5 ounces of seed were presented by A. E. V. Richardson, agricultural superintendent of the Department of Agriculture at Melbourne, Victoria, Australia. It was first grown in a 5-foot row in the classification nursery at the Sherman County branch station, Moro, Oreg., in 1916. Since 1918 it has been grown at the Plant-Introduction Garden, Chico, Calif., and because of its high yield at that point it has been increased and distributed for commercial growing in California (*67*, p. 24).

Distribution.—Grown at experiment stations in California, Washington, Oregon, Idaho, and Utah and commercially in Butte County, Calif., in 1920.

LYNN (LYNN RUST PROOF).

Description.—Plant spring habit, midseason, midtall to tall; stem white, glaucous, strong, stout; spike awnless, linear-oblong, middense, erect; glumes glabrous, yellowish white, midlong, midwide; shoulders narrow to midwide, oblique to elevated; beaks midwide, obtuse, 1 mm. long; apical awns few, 2 to 15 mm. long; kernels white, short, semihard to hard, ovate; germ midsized; crease midwide, deep; cheeks angular; brush midsized, midlong, collared.

The variety differs from both Defiance and Surprise in having an oblong spike and fairly hard kernels. The Lynn is resistant to some forms of stem rust under California conditions.

History.—This variety probably is a selection from Defiance or Surprise. According to R. B. Luther, Templeton, Calif., Lynn (Lynn Rust Proof) was first propagated by Lynn Brothers, of Paso Robles, San Luis Obispo County, Calif.

Distribution.—Grown in San Luis Obispo County, Calif., where it was introduced about 1914.

Synonyms.—Arizona No. 39, Pride of Oregon. According to W. E. Bryan, plant breeder at the Arizona Agricultural Experiment Station, "Arizona No. 39 was selected originally from a field of soft wheat grown in the Yuma Valley in 1912." It is very similar to Lynn except that the kernels are somewhat harder. Pride of Oregon was distributed by the Murphy Seed Store, Albany, Oreg. The variety is very similar to Lynn and Arizona No. 39, except that the kernels are harder than either. Both Arizona No. 39 and Pride of Oregon have the rust resistance of Lynn.

REGENERATED DEFIANCE.

Description.—Plant spring habit, late, midtall to tall; stem glaucous when green; white, strong; spike awnless, linear-oblong, middense, erect; glumes glabrous, white, midlong, narrow; shoulders narrow, oblique to square; beaks narrow, triangular, acute, 0.8 to 1.5 mm. long; apical awns wanting to few, 3 to 10 mm. long; kernels white, short, hard, broadly oval to ovate; germ midsized; crease wide, deep; cheeks usually angular; brush midsized, midlong, sometimes collared.

This variety differs from Defiance in being later and taller and in having a longer and broader spike and a shorter and harder kernel. The kernel differs from Dicklow in being shorter and harder and in having a deeper crease. Spikes, glumes, and kernels of this variety are shown in Plate XII, *B*, and a single spike in Plate VI, Figure 4.

History.—This is one of several selections of Defiance wheat made by Prof. A. E. Blount at the Colorado Agricultural Experiment Station. In 1903, Prof. A. H. Danielson found this particular selection in a bottle marked Defiance, which Professor Blount had left some 12 years previous. He planted all of the seed found, about 50 kernels, but only 3 produced seed. This seed was grown and further selected and increased until 1907, when it was distributed as "Regenerated Defiance."

Distribution.—Grown mostly under irrigation in Colorado, South Dakota, Idaho, Montana, New Mexico, Nebraska, and Wyoming. The distribution of this strain of Defiance can not be separated from Defiance itself, so the distribution of both are shown in Figure 20.

NEW ZEALAND.

Description.—Plant spring habit, midseason, midtall to tall; stem white, strong; spike awnless, linear-oblong, middense, inclined; glumes glabrous, white, midlong, narrow; shoulders narrow, wanting to oblique; beaks midwide, obtuse, 0.5 to 1 mm. long; apical awns few, 3 to 30 mm. long; kernels white, midlong to long, soft, ovate; germ midsized; crease midwide, middeep; cheeks rounded; brush midsized, midlong.

This variety is very similar to Pacific Bluestem, but differs principally in having a longer and laxer spike, narrower shoulders, and larger kernels. Spikes, glumes, and kernels of this wheat are shown in Plate XIII, *A*.

History.—The origin of New Zealand wheat is undetermined. It is possibly the Blé de Zélande wheat of France, described by Heuzé (*112*, p. 79). According to J. H. Wittuer, county agent, Vernal, Utah, New Zealand wheat was introduced into Utah about 1890, where it has been grown sparingly until the present time.

Distribution.—Grown in 5 counties in Idaho and 11 counties in Utah.

Synonyms.—Ninety-Day and Ruby. These names are recorded as synonyms for the variety by Stewart (*186*, p. 166), Ninety-Day being used in Salt Lake County and Ruby in Sanpete County, Utah.

PILCRAW (PILCRAW ENORMOUS).

Description.—Plant spring habit, midseason, midtall, stem white, strong; spike awnless, clavate, dense, erect; glumes glabrous, white to yellowish, short, wide; shoulders midwide to wide, square to elevated; beaks narrow, acute, 0.5 to 1.0 mm. long; apical awns several, 8 to 40 mm. long; kernels white, midlong to long, soft, ovate, distinctly humped; germ midsized; crease midwide, middeep to deep, pitted; cheeks rounded; brush large, midlong to long.

This variety is quite similar to Surprise, but differs principally in being earlier and shorter and in having more numerous and longer apical awns and larger and humped kernels. Spikes, glumes, and kernels of this wheat are shown in Plate XIII, *B*.

History.—Hugh A. Crawford, Napa, Calif., obtained this variety from a neighbor who said he had noticed an unusual stool of wheat near an unfrequented road and who cut it when ripe and started experimenting with it. Mr. Crawford bought the original seed in 1913 and increased it until in 1917 he had 360 acres growing at Winters, Calif. He named it Pilcraw Enormous and distributed it.

Distribution.—Grown in Napa and Sacramento Counties, Calif.

RICE.

Description.—Plant winter habit, early, midtall; stem white, midstrong; spike awnless, fusiform, dense, erect; glumes glabrous, white, short, midwide; shoulders midwide to wide, oblique to square; beaks nearly wanting; apical awns wanting to few, 1 to 10 mm. long; kernels pale red, short to midlong, soft, ovate; germ small to midsized; crease midwide, shallow to middeep; cheeks angular; brush midsized, midlong.

This variety is very similar to Zimmerman, but differs principally in having a more fusiform although denser spike, wider shoulder, and longer beaks and apical awns. The kernels also are harder. Spikes, glumes, and kernels of Rice wheat are shown in Plate XIV, *A*.

History.—The origin of Rice wheat is undetermined, although it is known to be an old variety in the United States. In 1883 it was first reported as a "new variety tested by M. F. P., Mount Pleasant, Ontario County, N. Y." (*150*, p. 657), and it also was mentioned in that year by C. S. Plumb (*153*, p. 310) in a paper entitled "The Wheats of the World," read at the Batavia Institute.

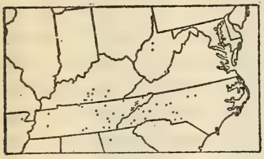


FIG. 24.—Outline map of a portion of the east-central United States, showing the distribution of Rice wheat in 1919. Estimated area, 30,900 acres.

Distribution.—Grown in Arkansas, Georgia, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia. The distribution is shown in Figure 24.

Synonyms.—Early Rice, Red Rice, White Rice. These are names used for the variety by growers in one or another of the States named.

MINHARDI.

Description.—Plant winter habit, midseason, midtall; stem white, slender, strong; spike awnless, fusiform, middense, erect; glumes glabrous, white, midlong, narrow; shoulders narrow, wanting to oblique; beaks wide, obtuse, 1 mm. long; apical awns several, occurring on upper third of spike, usually incurved, 2 to 15 mm. long; kernels red, short to midlong, soft to semihard, ovate; germ small; crease midwide, middeep; cheeks usually rounded; brush midsized, midlong. This is one of the most winter hardy wheats grown in America.

History.—The Minhardi was originated at the Minnesota Agricultural Experiment Station. It is one of the progeny of a cross made between Odessa (female) and Turkey (male) in 1902, when Prof. W. M. Hays was in charge of the plant breeding. Several selections from this cross grown in 1915 showed unusual promise for winter hardiness, and, after further experiments reported by Hayes and Garber (*106*, p. 17–28), the most hardy strain (Minn. No. 1505) was named Minhardi and distributed.

Distribution.—Grown at experiment stations in the Great Plains area and commercially in Minnesota in 1920.

Synonym.—Minnesota No. 1505. This is the Minnesota accession number under which Minhardi was known and grown until it was named.

LOFTHOUSE.

Description.—Plant winter habit, midseason, midtall; stem white, midstrong; spike awnless, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide; shoulders wanting to narrow, oblique; beaks wide, obtuse, 1 mm. long; apical awns several, 5 to 30 mm. long; kernels red, midlong, soft, ovate; germ small; crease midwide, middeep; cheeks usually angular; brush small, midlong.

There is some confusion as to the identity of this variety. It frequently has been referred to as white kerneled and often is confused with the Kofod variety.

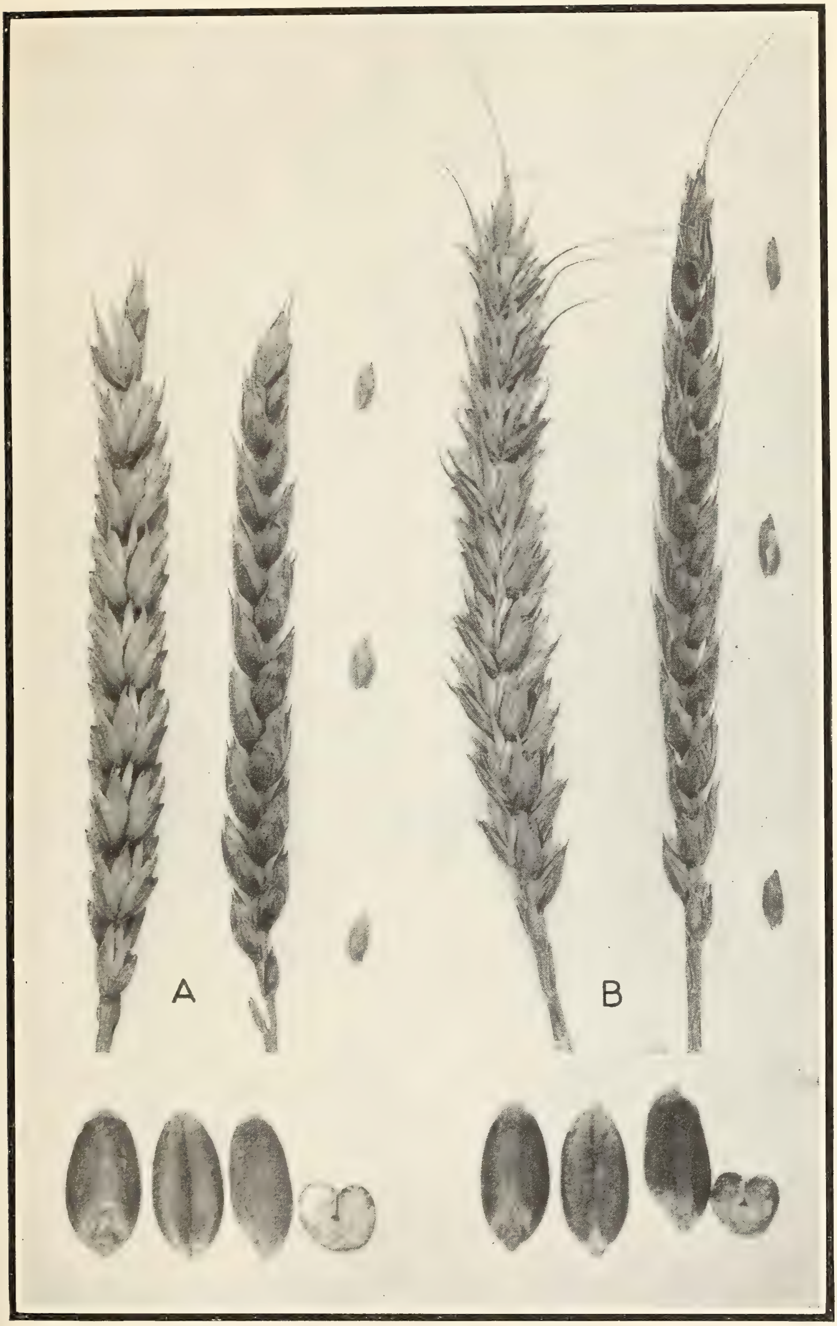
History.—A wheat by the name of Lofthouse has been grown in Utah since about 1890. The sample from which were grown the plants described above was obtained by the Nephi, Utah, substation from the State station at Logan, Utah, in 1904. The origin of the variety can not be accurately traced, and considerable confusion exists as to whether the variety originally was a white-kerneled or red-kerneled wheat. According to Prof. J. B. Nelson, now of the Montana Agricultural Experiment Station, the variety became established in Utah from seed distributed by a Mr. Lofthouse, a farmer at Paradise, Utah, about 16 miles south of Logan. Professor Nelson states that in 1893 or 1894, in a conversation with Mr. Lofthouse regarding the best varieties of wheat for dry farming, he was told that Mr. Lofthouse had received a sample of soft white winter wheat from the United States Department of Agriculture a year or two previously, which promised to produce large yields and was a good milling wheat. He stated that he had sufficient seed on hand at that time to sow a good acreage, that he was going to sell it to the dry farmers at market value, and that he had named the wheat Lofthouse. The wheat was hardy, standing the winter better than other varieties, and soon became the most extensively grown winter wheat in northern Utah and southern Idaho. While the above statement shows that the wheat originally was white kerneled, the wheat grown at Nephi, Utah, since 1904 is red kerneled.

Distribution.—Grown in Bannock, Cassia, and Franklin Counties, Idaho, and Boxelder, Cache, Sevier, and Washington Counties, Utah. Part of this distribution was reported as white kerneled.

Synonyms.—Winter La Salle, Winter Nellis. Winter La Salle is a name used as a synonym for Lofthouse wheat in Utah. It is thought to be the name under which the wheat later named Lofthouse was sent to Utah by the United States Department of Agriculture. The writers, however, are without a history of the origin or distribution of this wheat. Winter Nellis is also a name commonly used for Lofthouse wheat in Utah.

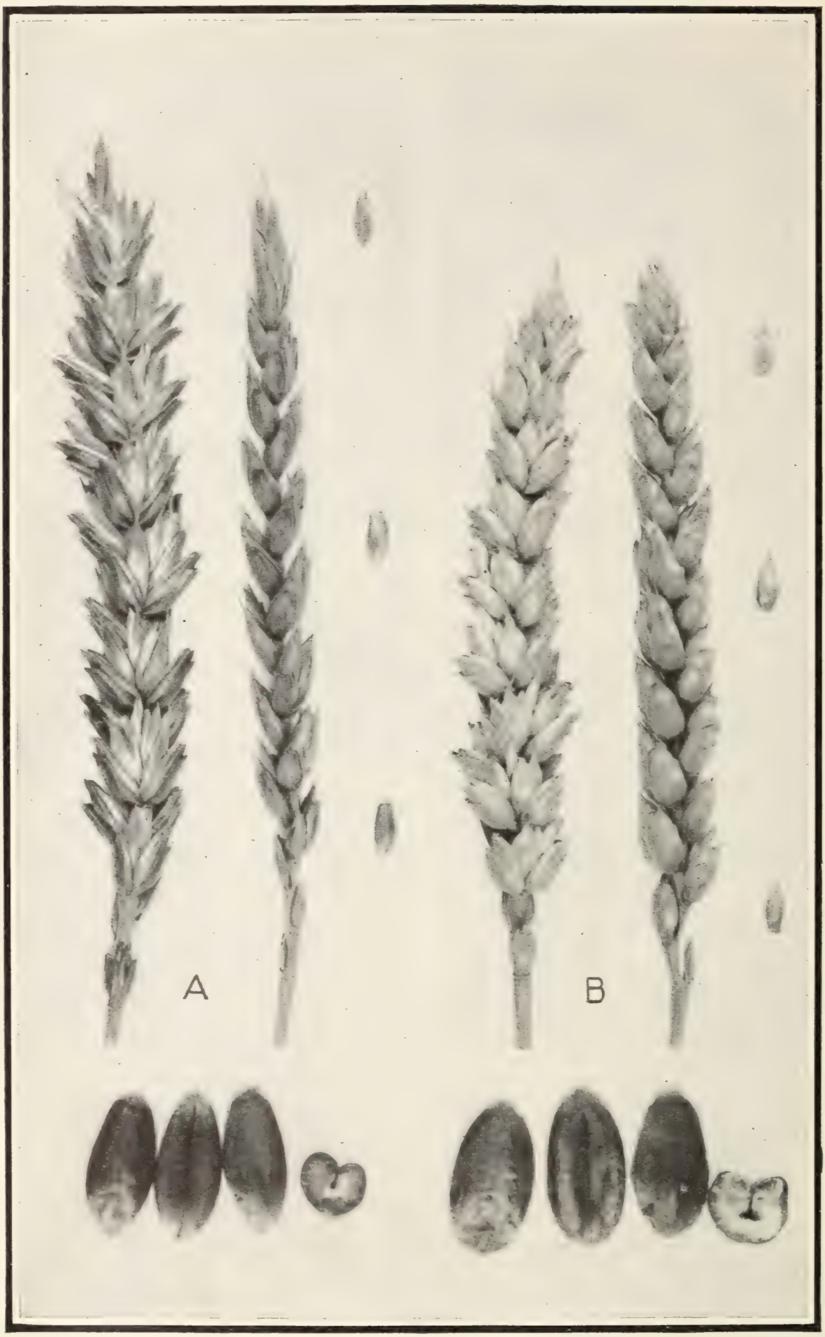
BIG FRAME.

Description.—Plant winter habit, midseason, midtall; stem white, midstrong; spike awnless, fusiform, middense, inclined; glumes glabrous, white, midlong,



RICE (A). BUFFUM NO 17 (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



LEAP (A). WALKER (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

midwide; shoulders midwide, oblique to square; beaks midwide, obtuse, 0.5 mm. long; apical awns several, often incurving on upper third of spike, 3 to 20 mm. long; kernels red, midlong, soft, ovate to oval; germ small; crease midwide, middeep; cheeks rounded; brush midsized; midlong.

History.—The origin of this wheat is undetermined. It is recorded by Carleton (*58*, p. 44) as a wheat of American origin. It was an important variety in Nebraska in the nineties, but now has practically disappeared from cultivation.

Distribution.—Grown in Butler County, Nebr.

BUFFUM NO. 17.

Description.—Plant winter habit, hardy, late, midtall; stem white, midstrong; spike awnless, linear-fusiform, middense to lax, inclined; glumes glabrous, white to yellowish, long, narrow; shoulders wanting to narrow, oblique; beaks wide, obtuse, 1 mm. long; apical awns several, 3 to 30 mm. long; kernels, red, short to midlong, soft to semihard, ovate; germ small; crease midwide, middeep; cheeks usually rounded; brush midsized to large, long.

This variety has unusual winter hardiness. Its spikes, glumes, and kernels are illustrated in Plate XIV, *B*.

History.—It originated from the selection of a single plant having an awnless spike, found in a field of Turkey wheat by B. C. Buffum, of Worland, Wyo. Seed of this selection was increased and was distributed commercially by Mr. Buffum under the above name in 1912. In an unpublished article on this wheat, dated May 20, 1915, and presented at the cereal conference, Berkeley, Calif., in June, 1915, the origin of the variety is given by Mr. Buffum as follows:[8]

> The discovery of a beardless mutant was not premeditated. . . . Occasional reversions in large fields to the bearded Kharkof type and some of the second-generation variations from crosses with No. 17 definitely prove its origin to be that stated, a mutant of Turkey Red.

Distribution.—Grown in Sheridan and Washakie Counties, Wyo.

LEAP (LEAP'S PROLIFIC).

Description.—Plant winter habit, early, midtall; stem white, midstrong; spike awnless, fusiform, middense to lax, inclined to nodding; glumes glabrous, yellowish white, midlong, midwide, easily deciduous; shoulders midwide, oblique to square; beaks wide, acute, 0.5 mm. long; apical awns few, 3 to 10 mm. long; kernels red, midlong, soft, ovate; germ small; crease midwide to wide, middeep; cheeks usually angular; brush small, midlong. Spikes, glumes, and kernels of Leap wheat are shown in Plate XV, *A*.

History.—The variety is reported to have originated from a single plant found in a field of Mediterranean by the oldest son of J. S. Leap, of Virginia. From the five heads gathered in 1901, Mr. Leap increased the wheat until 1905, when he thrashed 190 bushels grown from 10 bushels of seed. T. W. Wood & Sons, seedsmen, of Richmond, Va., first distributed the variety as Leap's Prolific. General distribution of the wheat started about 1907, and it since has become very popular (*137*, p. 44).

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[8] Buffum, B. C., Buffum's No. 17. Paper at Cereal Conference, June, 1915. Unpublished.

Distribution.—Grown as Leap's Prolific in Alabama, Connecticut, Delaware, Georgia, Illinois, Indiana, Kentucky, Maryland, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia. The distribution is shown in Figure 25.

Synonyms.—Hastings Prolific, Woods Prolific, and Woolf. Hastings Prolific is a name used for Leap wheat in Alabama, Georgia, and South Carolina. Woods Prolific is used for the variety in Tennessee and Virginia. These names probably are derived from the names of the seed firms selling it. Woolf is a name used for the Leap variety in Muhlenberg County, Ky.

ONTARIO WONDER.

Description.—Plant winter habit, midseason, midtall to tall; stem white, midstrong; spike awnless, fusiform, middense, nodding; glumes glabrous, white, midlong, narrow; shoulders wanting to narrow, oblique to rounded; beaks wide, obtuse, 1.0 mm. long; apical awns few, 3 to 10 mm. long; kernels pale red, midlong, soft, ovate; germ small to midsized; crease midwide, middeep; cheeks angular to rounded; brush midsized, midlong.

History.—This is a Canadian variety of undetermined origin. The variety was grown in the United States by the Ohio Agricultural Experiment Station as early as 1888 (*113*, p. 28).

Distribution.—So far as known this variety is grown only experimentally in the United States, although it is commercially grown in Ontario.

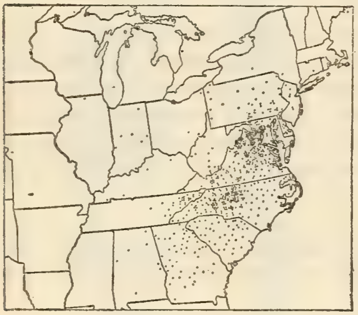

FIG. 25.—Outline map of a portion of the eastern United States, showing the distribution of Leap wheat in 1919. Estimated area, 513,100 acres.

ZIMMERMAN.

Description.—Plant winter habit, early, midtall; stem white, strong; spikes awnless, oblong-fusiform, middense, erect to inclined; glumes glabrous, white, short, midwide; shoulders midwide, oblique to square; beaks wide, obtuse, 0.5 mm. long; apical awns few, 3 to 10 mm. long; kernels pale red, usually short, soft, ovate; germ small to midsized; crease midwide, middeep; cheeks rounded; brush small, midlong.

This variety is quite similar to Fultz, but differs principally in being slightly earlier and having white straw and a smaller kernel.

History.—Zimmerman is reported to have been originated about 1837 near Frederick, Md., by Henry Zimmerman, who noticed three heads of singular appearance near the edge of one of his wheat fields. They were saved, the seed sown and increased, and at the end of the sixth year he had over 60 bushels; in the seventh year the wheat was sold to the public (118). The kernel is described as "of a rich yellow." This might indicate that it was a white-kerneled wheat. From 1847 to 1850 the name "Zimmerman" was applied in literature to both a white and a red wheat. References to red-kerneled Zimmerman wheat in the fifties show it was quite widely grown in Maryland, Virginia, and Pennsylvania, and by the early nineties it was an important wheat in eastern Kansas, where it is still grown.

Distribution.—Grown sparingly in eastern Kansas and in Missouri.

WALKER.

Description.—Plant winter habit, early to midseason, midtall to tall; stem white, strong; spike awnless, oblong-fusiform, middense, inclined; glumes glabrous, white, short, wide; shoulders midwide to wide, oblique to square; beaks wide, obtuse, 0.5 mm. long; apical awns few, 3 to 10 mm. long; kernels pale red, midsized, soft, ovate; germ midsized; crease midwide, middeep; cheeks rounded; brush small, midlong.

Walker differs from Zimmerman in being slightly later and taller and has a more inclined spike, wider glumes, and larger kernels and germ. Spikes, glumes, and kernels of the Walker wheat are shown in Plate XV, *B*.

History.—The origin of Walker is undetermined. It is known to be an old variety of the eastern United States and was being replaced by Tappahannock in Jackson County, N. C., in 1871 (*8*, p. 131).

Distribution.—Grown in Arkansas, Illinois, Kentucky, Missouri, Oklahoma, Tennessee, and Texas. This distribution is shown in Figure 26.

HARVEST QUEEN.

Description.—Plant winter habit, midseason, tall; stem white, strong; spike awnless, oblong, dense, erect to inclined; glumes glabrous, white, midlong, midwide; shoulders wide, oblique to square; beaks wide, obtuse, 0.5 mm. long; apical awns few, 3 to 10 mm. long; kernels dull red, midlong, soft, ovate; germ midsized; crease midwide to wide, middeep; cheeks rounded; brush midsized, midlong.

This variety is distinct in having tall, bright, strong straw and a thick oblong spike. Spikes, glumes, and kernels of this variety are shown in Plate XVI, *A*.

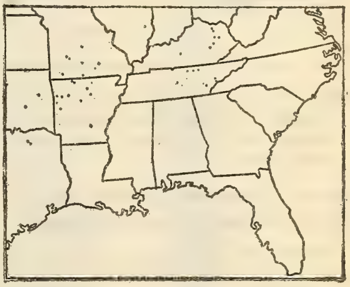

FIG. 26.—Outline map of the southeastern United States, showing the distribution of Walker wheat in 1919. Estimated area, 24,300 acres.

History.—The name Harvest Queen was used early for a white wheat, but this use apparently has been discontinued. The earlier names under which the wheat described above was known were Black Sea, Oregon Red, and Red Cross. The name Harvest Queen is claimed by E. S. Marshall,[9] of De Soto, Kans., to have been applied to the variety by him. He selected a tall promising stool of the wheat from some other variety in 1895, increased it in 1896, and named it in 1897. Mr. Marshall stated that he selected the name Harvest Queen, because he thought he had a better wheat than Harvest King, which was then being widely advertised by the J. A. Everitt Seed Co., of Indianapolis, Ind. For several years he and his father, Conrad Marshall, continued to select the variety. Most of the Harvest Queen grown in Johnson County, Kans., and vicinity apparently is from seed originally distributed from the Marshall farm. Harvest Queen wheat was advertised and distributed by the Barteldes Seed Co., of Lawrence, Kans., and by the J. A. Everitt Seed Co., of Indianapolis, Ind. The latter firm (*89*) claim to have distributed it first in 1896, which scarcely could be possible if Mr. Marshall is correct in his dates.

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[9] Interview by J. A. Clark, S. C. Salmon, and C. E. Graves, on June 6, 1921.

Distribution.—Grown as Harvest Queen in Arkansas, Illinois, Indiana, Kansas, Michigan, Missouri, Ohio, Oklahoma, Pennsylvania, Tennessee, West Virginia, and under the synonymous names in Iowa and Nebraska. Figure 27 shows the distribution of the variety.

Synonyms.—Black Sea, Canadian, Canadian Fife, Imported Scotch, Italian Wonder, Kansas Queen, May Queen, New 100, Oregon Red, Prairie Queen, Prizetaker, Red Cross, Salzer's Prizetaker, Virginia Reel, and Winter Queen.

Black Sea is a name used for the variety in Doniphan County, Kans., where it has been grown under that name for eight years. Black Sea was an important winter wheat in Wisconsin in 1849 (*62*, p. 205). This name also has long been used in the United States for a bearded spring wheat. Canadian and Canadian Fife are names used for the variety in Marion County, Mo. Imported Scotch grown in Webster County, Mo., apparently is Harvest Queen. Concerning this wheat, J. C. Preston, of Seymour, Mo., stated in correspondence with the Office of Cereal Investigations as follows:

> I got this wheat on the farm of Milton, near Leuchars, Fife County, Scotland in 1910. A Mr. Thompson was tenant there. Just brought about one handful in my pocket. I was told that it was first-prize wheat at the Royal Show in 1909.

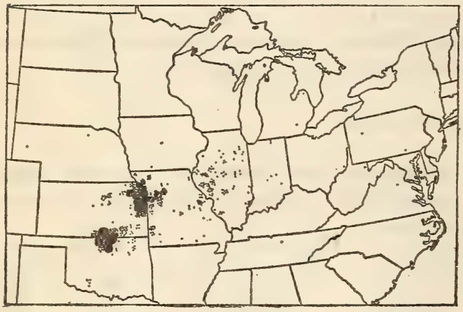


FIG. 27.—Outline map of a portion of the United States, showing the distribution of Harvest Queen wheat in 1919. Estimated area, 1,007,600 acres.

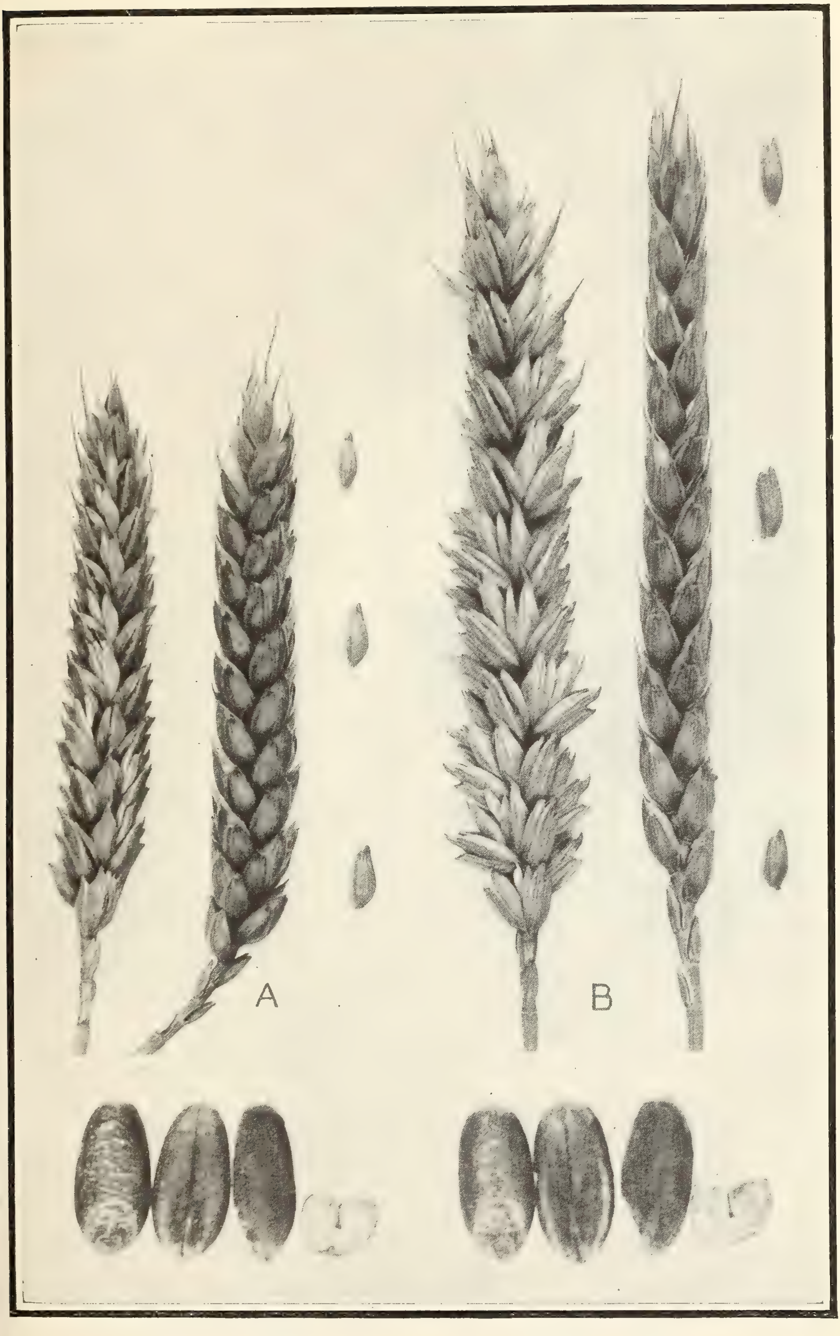
Italian Wonder is a name used for the variety in Cowley County, Kans. Concerning this wheat, C. M. Wallis, of Winfield, Kans., wrote the Office of Cereal Investigations the following information:

> About 10 years ago Tom Isnagle found scattering heads of exceedingly large and well-developed berry. He went through and selected them and planted the seed. He got such good results he continued until he raised enough to seed his farm and called it Italian Wonder; then began to sell seed.

Kansas Queen, May Queen, Prairie Queen, and Winter Queen are names used for the Harvest Queen variety in several counties in northeastern Kansas. There is considerable confusion in the name May, as it is applied to several varieties. May Queen, therefore, should not be confused with Red May and Little May. New 100 is a designation used for Harvest Queen wheat in Howard County, Mo. Oregon Red is an old name for the variety and is still used in Cowley County, Kans., and Grant and Payne Counties, Oklahoma.

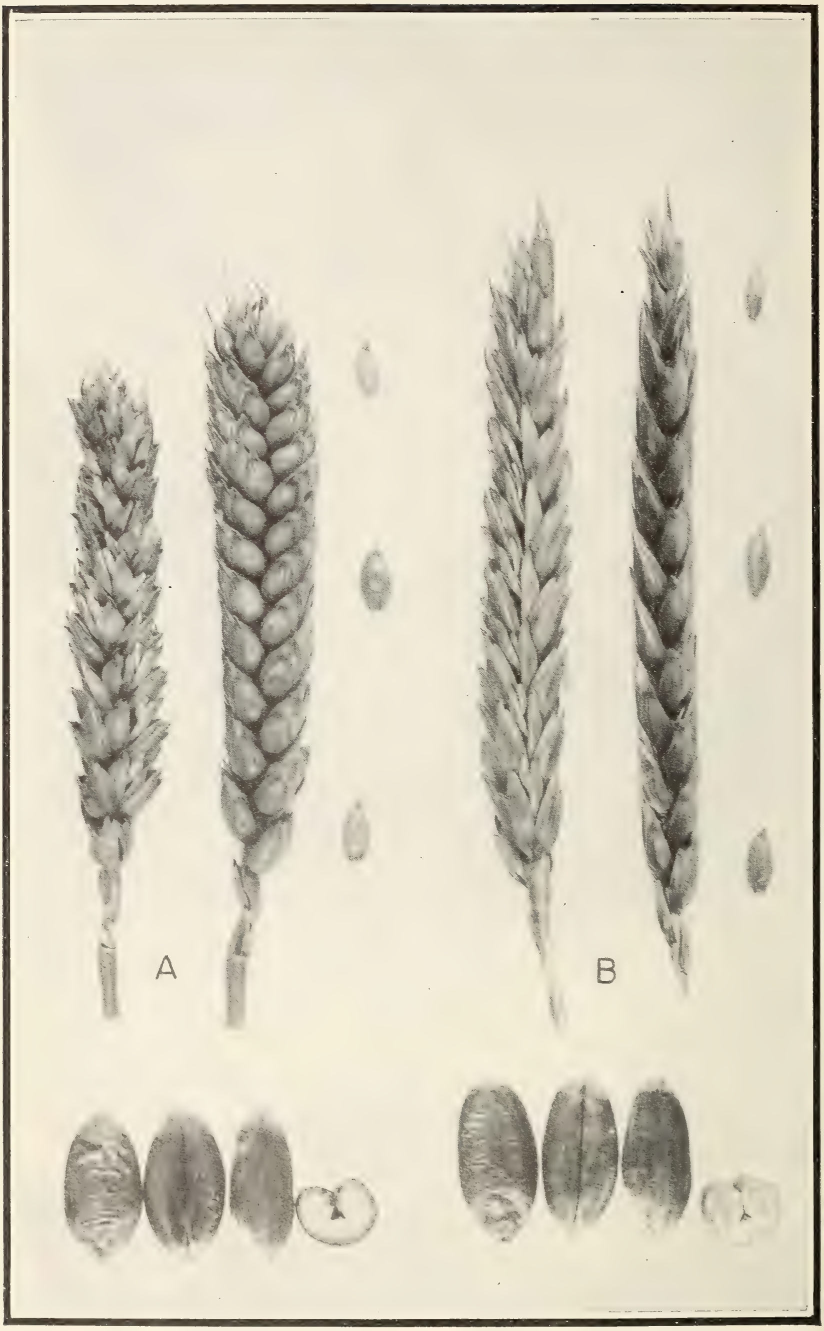
Red Cross is the name under which the above-described wheat has been grown in Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, and Nebraska. The name has been commonly used for the Harvest Queen variety in Missouri for 25 years or more. Its origin is undetermined. It undoubtedly is an earlier name for the variety than Harvest Queen, but as the name Red Cross has been applied to other varieties and as this variety has become so well known as Harvest Queen, the latter name is used here.

Prizetaker and Salzer's Prizetaker are names under which the Harvest Queen variety is grown in Illinois and neighboring States, although the name was used by the John A. Salzer Seed Co., of La Crosse, Wis., for the Goldcoin variety.



HARVEST QUEEN (A). PROSPERITY (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



RED RUSSIAN (A). CLIMAX (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

Virginia Reel is a name used for Harvest Queen wheat in Douglas County, Kans., where, according to H. A. Colles, of Sibley, Kans., it has been grown for 20 years.

PROSPERITY (AMERICAN BRONZE).

Description.—Plant winter habit, midseason, midtall; stem glaucous when green, white, strong, coarse; spike awnless, linear-oblong, broad, middense, nodding; glumes glabrous, white, midlong, wide; shoulders wide, oblique to square; beaks wide, obtuse, 1 mm. long; apical awns few, 3 to 10 mm. long; kernels red, midlong, soft, ovate; germ midsized; crease wide, deep; cheeks angular; brush midsized, midlong.

This variety is marked by its broad, nodding spike and the very glaucous appearance of the entire plant while immature. Plate XVI, *B*, shows spikes, glumes, and kernels of this variety.

History.—It was originated by A. N. Jones, of Newark, Wayne County, N. Y. Mr. Jones first called it No. 8, but later named it American Bronze.[10] It was first advertised and distributed in 1890 by Peter Henderson & Co., seedsmen, of New York City, and was said by them to be the result of a cross between Martin Amber and Fultz (*110*). The name Prosperity came into use for the variety about 1895 (*27*). The origin of this name is undetermined, but the variety is now grown more widely as Prosperity than as American Bronze, and as the former is a more desirable name it is here used.

Distribution.—Grown as Prosperity in Indiana, Michigan, Missouri, Ohio, and Pennsylvania, and under its original name, American Bronze, in Michigan, New York, Ohio, and Pennsylvania. The distribution of this variety is shown in Figure 28.

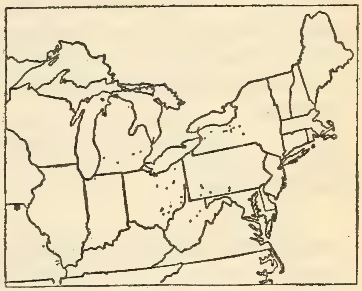


FIG. 28.—Outline map of a portion of the northeastern United States, showing the distribution of Prosperity wheat in 1919. Estimated area, 46,000 acres.

Synonyms.—Dutch, Hundred Mark, International No. 8, Invincible, Michigan Red, No Name, No. 8, Red Victory, Silver Chaff, Twentieth Century, and Zinn's Golden. The name Dutch is used for the variety in Cape Girardeau and Scott Counties, Mo. In correspondence with the Office of Cereal Investigations, W. J. Meyer, of Cape Girardeau, Mo., stated:

> Dutch wheat was introduced into that county from Scott County, Mo., about four or five years ago and is now more extensively grown than any other variety, and is known also as "No-Name" wheat.

Hundred Mark is a name used for the variety in Adams County, Ind., Hocking and Holmes Counties, Ohio, Calhoun County, Mich., and Westmoreland County, Pa. International No. 8 is the name under which the wheat was distributed by the International Seed Co., Rochester, N. Y. The variety is still grown under this name in Cass County, Mich., and in several counties in New York. Invincible is a name used as a synonym for American Bronze since about 1895. The origin of the name is undetermined. It was reported in 1919 from Blair County, Pa. Michigan Red is a name used for the variety in Lorain County, Ohio, for 10 years or more. No. 8 is the designation originally given the wheat by Mr. Jones, that being its trial-bed number, and later used by him as a synonym for American Bronze. Red Victory is a name applied to Prosperity by J. B. Barton, Otsego, Mich., who states that it constitutes 50 per cent of the wheat being grown near Otsego, Allegan County, Mich. He wrote the Office of Cereal Investigations concerning it as follows:

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[10] Printed letterheads of Mr. Jones.

> I bought the seed four years ago and the farmer brought it to this locality from about 45 miles north of me. The man I got it of did not know what it was, and the man he got it from did not know. Before it matured the first crop for me I thought it was Fultz, but as it matured I thought not, so I sent six heads to Lansing to the Michigan Agricultural College, and asked them to name it. They wrote me it was not Fultz, nor did it belong to the Fultz family, and I had a mighty good wheat, and I could name it just as well as they could. I sold all my 1918 crop for seed and, it being in the midst of the Great War, I gave it the name of Red Victory.

Silver Chaff is a name used for the Prosperity variety in New York and other Eastern States. As the name also is used for Martin wheat in this section, the distribution of the two varieties under this name is confused. Twentieth Century is a name used for Prosperity in Monroe County, Ohio, where it constitutes about 25 per cent of the wheat grown in the vicinity of Kuhn. Zinn's Golden is used for Prosperity wheat in Barbour, Braxton, and Upshur Counties, W. Va. Concerning the origin of the name, B. C. Rodibough, of Hall, W. Va., has written as follows:

> It seems to have originated in Barbour County, W. Va., on the farm of a man by the name of Zinn, and has been grown in this locality quite extensively for about 15 years.

FORWARD.

Description.—This variety has not been grown by the writers. Spike samples furnished by Dr. H. H. Love show that it is somewhat similar to Prosperity, but differs in having slightly narrower and more nearly fusiform spikes and incurved apical awns.

History.—Forward was originated by the plant-breeding department of the Cornell University Agricultural Experiment Station, Ithaca, N. Y., in cooperation with the Office of Cereal Investigations, United States Department of Agriculture. During the experimental stages it was known as Cornell Selection 123–32. Concerning the variety, Dr. Love, who is in charge of the cooperative experiments at Cornell, has written as follows:[11]

> The Forward is a white chaff, beardless, red-kerneled wheat selected out of a commercial lot of Fulcaster and under test has proved to be winter hardy and a good yielder. It has outyielded Fulcaster and bids fair to be one of our best red-kerneled sorts.

Distribution.—Forward was first distributed for commercial growing in New York in the fall of 1920.

SQUAREHEAD.

Description.—Plant winter habit, late, tall; stem white, coarse, strong; spike awnless, linear-clavate, middense, erect to inclined; glumes glabrous, white, midlong, wide; shoulders midwide, oblique to square; keel incurved above; beaks wide, obtuse, 1 mm. long; apical awns few, 1 to 10 mm. long; kernels red, midlong, soft, ovate, sometimes broadly ovate; germ small to midsized; crease wide, deep; cheeks usually rounded; brush midsized, midlong to long.

This and the similar varieties, Red Russian and Sol, are distinct in being very late-maturing winter wheats and in having a very dense clavate spike and strong straw. They are adapted for growing only in mild humid sections. Their milling value is inferior to that of most soft red winter wheat varieties grown in the United States.

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[11] Correspondence of the Office of Cereal Investigations, dated Mar. 19, 1921.

History.—This is an old English variety of undetermined origin. It is either one of several different Squarehead types or the parent of the several types recently developed in England and Sweden. Its cultivation in the United States under the name Squarehead or English Squarehead is known to date only from 1908, when the above-described wheat was brought from England by R. Clanfield, of Ballston, Oreg.

Distribution.—Grown as English Squarehead in Polk County, Oreg.

Synonyms.—Big English, Clanfield, and English Squarehead. Big English and Clanfield were reported by Hyslop (*126*, p. 674) as names used for Squarehead wheat in Oregon. English Squarehead is used to indicate that the variety came from England.

RED RUSSIAN.

Description.—This variety differs from Squarehead only in being of shorter stature and in having a denser and more clavate spike. Spikes, glumes, and kernels of Red Russian are shown in Plate XVII, *A*.

History.—This variety undoubtedly is of English origin and is, or is derived from, the old Squarehead wheat. The origin of the variety, however, is undetermined. The name Red Russian seems to be used for the variety only in the Pacific Northwest section of the United States. The variety was introduced into the Palouse section of Washington about 1890 and has always been best known there under the name Red Russian (*93*, p. 5).

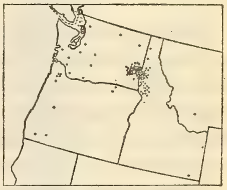


FIG. 29. — Outline map of the Pacific Northwest, showing the distribution of Red Russian wheat in 1919. Estimated area, 154,900 acres.

Distribution.—Grown in Idaho, Montana, Oregon, and Washington. This distribution is shown in Figure 29.

Synonyms.—Australian Club, Early Sunrise, Squarehead, German Red, Montana Deal, and Red Walla.

Australian Club is used as a synonym for Red Russian in Lewis County, Wash. Early Sunrise and German Red are names which, according to Prof. G. R. Hyslop, of the Oregon Agricultural College, have been used for Red Russian wheat in the State of Oregon.

Squarehead is a name used for Red Russian wheat by experiment station agronomists to associate the wheat with the old and well-known Squarehead wheat of England, which it very closely resembles. Montana Deal is a name reported by J. W. Little, of Nezperce, Lewis County, Idaho, to be used as a synonym for Red Russian. Red Walla is a name sometimes used for the Red Russian variety in the Pacific Northwest, as it is the name of the subclass in which grain of the variety is marketed when sold under the United States Official Grain Standards.

SOL.

Description.—The Sol variety differs only slightly from Red Russian, but has a slightly less clavate spike and longer and wider leaves, which are of a darker green shade.

History.—It was originated at the Svalof Plant-Breeding Station, Svalof, Sweden, and it is said to have been derived from natural crossing, the parents probably being Swedish Island and English Stand-Up (*85*, p. 13). It was first put on the market by the Svalof Seed-Breeding Association in 1911. In the United States the variety was distributed as Sun by Charles H. Lilly & Co., seedsmen, of Seattle, Wash.

Distribution.—Grown as Sun in Pierce and San Juan Counties, Wash., and Sonoma County, Calif.

Synonym.—Sun. This is the English translation of the Swedish name Sol and is sometimes used for the variety.

OAKLEY (EXTRA EARLY OAKLEY).

Description.—Plant winter habit, early, midtall; stem faintly purple, midstrong; spike awnless, fusiform, middense, erect; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to square; beaks wide, obtuse, 0.5 mm. long; apical awns few, 2 to 15 mm. long; kernels red, midlong, soft, ovate; germ midsized; crease midwide, middeep; cheeks rounded to angular; brush midsized, midlong.

Oakley differs from Fultz in being earlier and having a more erect spike.

History.—The origin of Oakley (Extra Early Oakley) is undetermined. The variety was grown by the Kentucky Agricultural Experiment Station as early as 1891 (*94*, p. 112). It was reported to have been in high favor in Kentucky in the late nineties and always rated well by millers.

Distribution.—Grown in Cleveland County, N. C.

Synonyms.—Early Oakley, and Norwood or Neverfail. The latter names are used for Oakley wheat in Chatham County, N. C.

WYANDOTTE (WYANDOTTE RED).

Description.—Plant winter habit, early to midseason, midtall to tall; stem purple, midstrong; spike awnless, fusiform, middense, inclined to nodding; glumes glabrous, white, short, wide; shoulders midwide to wide, oblique to square; beaks narrow, obtuse, 0.5 mm. long; apical awns few, 1 to 15 mm. long; kernels pale red, usually short, soft, ovate; germ midsized; crease midwide to wide, shallow, middeep; cheeks angular; brush midsized, midlong.

Wyandotte differs from Fultz in being slightly earlier and shorter and in having a slightly shorter and more fusiform spike.

History.—The origin of Wyandotte (Wyandotte Red) is undetermined. It was grown by the Ohio Agricultural Experiment Station as early as 1886 from seed obtained from T. Balliet, of Nevada, Ohio (*80*, p. 20, 23). Seed of the variety was obtained by the Rural New Yorker in 1888 from J. A. Foote, of Crawfordsville, Ind., who grew the variety for the first time in 1887 (*22*, p. 591).

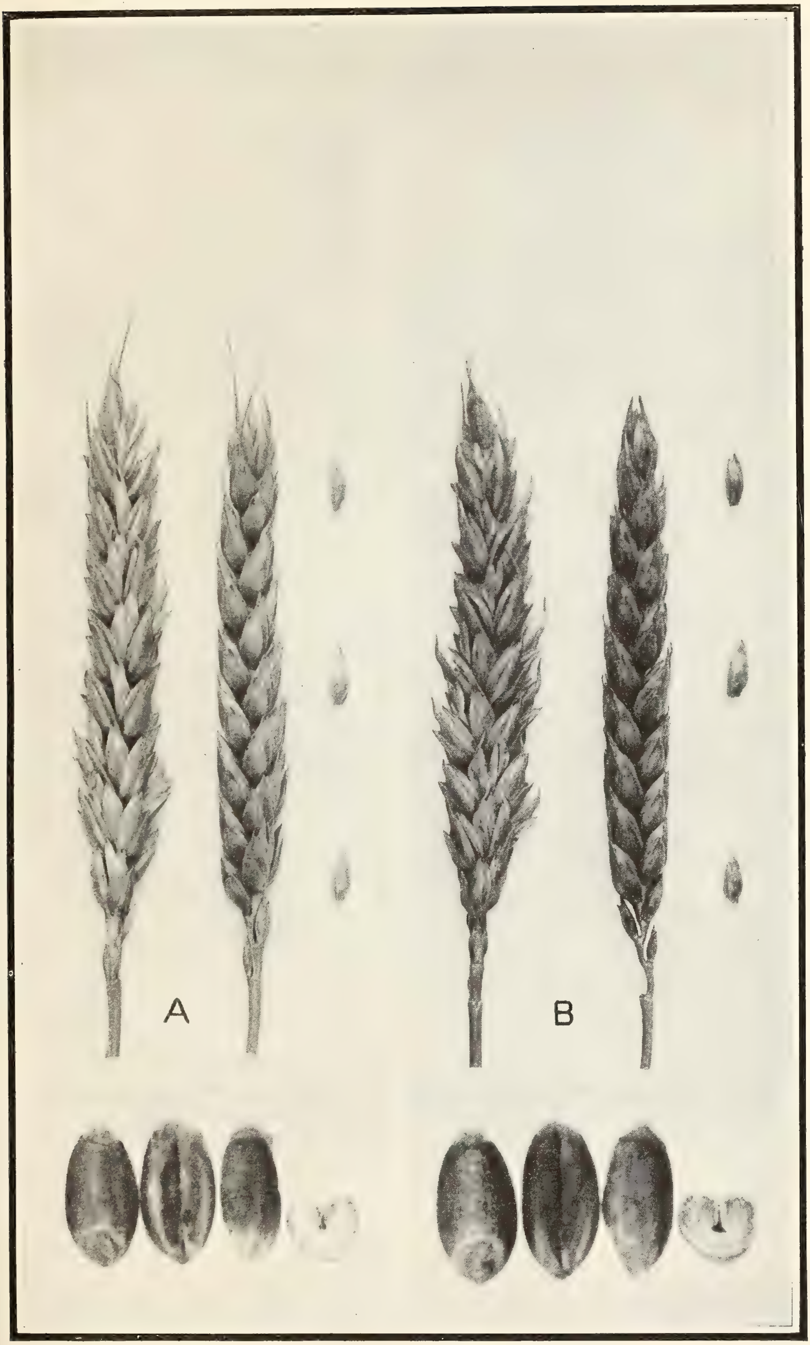
Distribution.—Grown in Wayne County, Ohio.

FLINT.

Description.—Plant winter habit, early to midseason, midtall; stem purple, midlong; spike awnless, oblong, dense, erect; glumes, glabrous, white, midlong, midwide; shoulders narrow, oblique to square; beaks midwide, obtuse, 0.5 to 1 mm. long; apical awns few, 2 to 40 cm. long; kernels pale red, short to midlong, soft, ovate; germ small; crease midwide, middeep; cheeks angular to rounded; brush midsized, midlong.

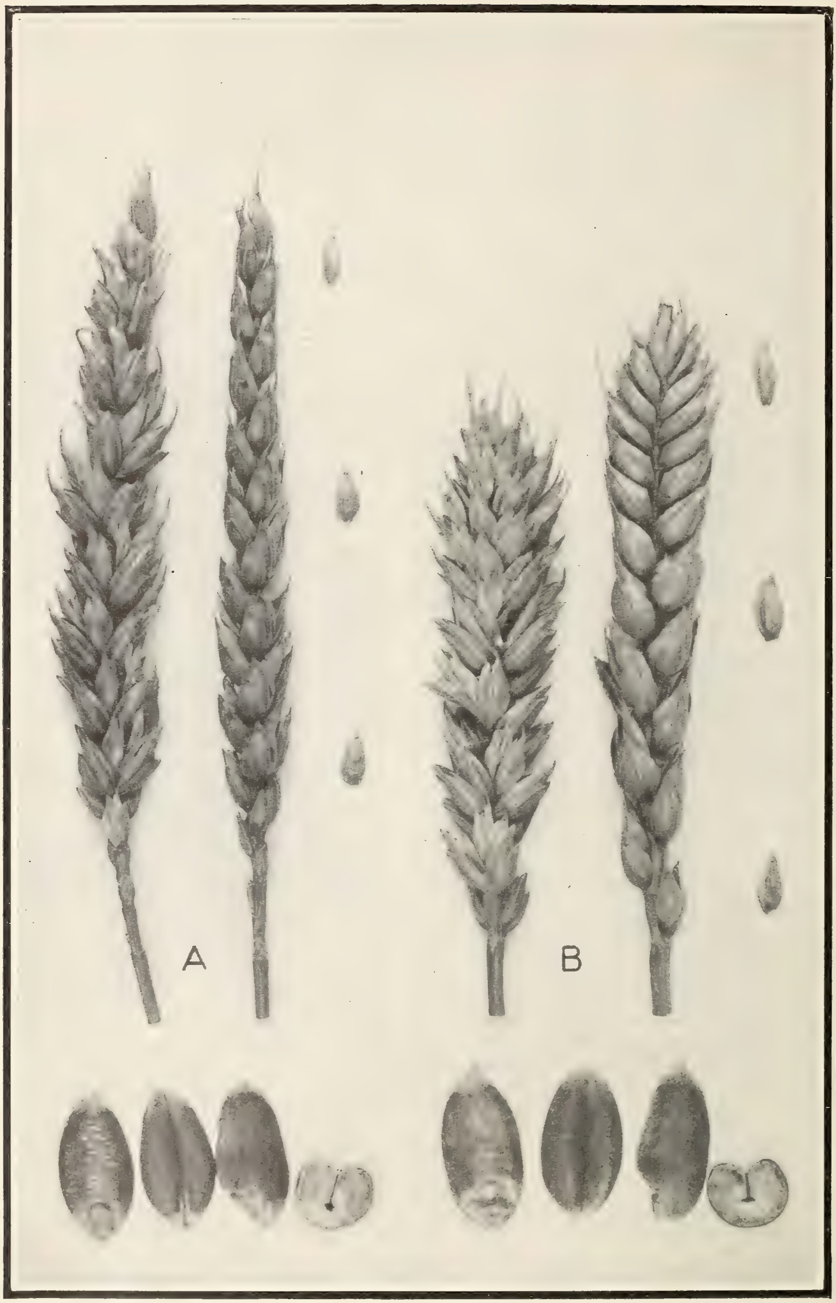
Flint differs from Fultz in being slightly earlier and shorter and in having more erect and oblong spikes, longer glumes, narrower shoulders, and longer apical awns. Spikes, glumes, and kernels of Flint wheat are shown in Plate XVIII, *A*.

History.—The origin of Flint wheat is undetermined. It is known to be an old wheat of the eastern United States. The early names for the variety and the literature concerning them are very confusing. A White Flint, claimed to have been introduced from Spain in 1814 (*103*, p. 217), which became widely



FLINT (A). PURPLESTRAW (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse sections, magnified 3 diameters.



FULTZ (A). FULTZO-MEDITERRANEAN (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

grown in the Eastern States from 1830 to 1850, was described by Harmon as awnless, with white glumes and hard white kernels. There seems to be no winter wheat of that description now grown, and the Flint wheat now in cultivation undoubtedly has red kernels, as described above, and is similar to wheat known as Little Red May, Early May, and Rappahannock. These are all old names in American wheat literature. Little Red May is listed by Killebrew (*130*, p. 56) as a variety of the above description which "was brought into Tennessee by Joseph Jacobs from Missouri, no doubt having been taken there from Kentucky or Virginia. It had, however, improved by its visit, and is a very prolific, and in some sections a very popular variety." The names Little Red May, Little Red, and Little May are still in use for this variety.

Early May was listed as a variety grown in Iowa as early as 1852 (*87*, p. 341) which later became an important variety in that State (*4*, p. 518). At least some of the wheat now grown under that name is Flint. The same is true for Rappahannock, which also is now used as synonymous with Red May and in 1875 was recorded as synonymous with Michigan Amber (*11*).

Distribution.—Grown as Flint in Georgia, North Carolina, Ohio, South Carolina, Virginia, and West Virginia, and under the synonyms in Alabama, Arkansas, Illinois, Missouri, and Tennessee. The distribution is shown in Figure 30.

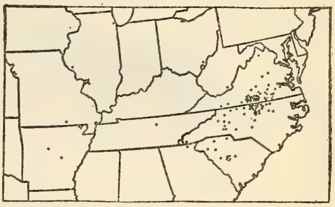


FIG. 30.—Outline map of a portion of the east-central United States, showing the distribution of Flint wheat in 1919. Estimated area, 97,200 acres.

Synonyms.—Early May, Little May, Little Red, Little Red May, May, Rappahannock, Red Davie, and Red May. The name Early May, as shown above, has long been used for Flint wheat. It was reported under this name in Alabama, Arkansas, Illinois, and South Carolina. Little May was reported from Platte County, Mo., and Little Red from Arkansas, Georgia, North Carolina, Tennessee, and Virginia. Little Red May and May are also occasionally used for Flint wheat. Rappahannock and Red May were reported by J. J. Collins, Spartanburg, S. C., as synonymous names for a wheat similar to Flint which had been grown for 25 years in that vicinity. Rappahannock was also reported from Oregon County, Mo. Red Davie is a local name for Flint wheat in Surry and Wilkes Counties, N. C. According to J. B. Fells, Red Davie has been grown for 50 years in the vicinity of Elkin, N. C.

FULTZ.

Description.—Plant winter habit, midseason, midtall; stem purple, midstrong; spike awnless, oblong-fusiform, middense, inclined to nodding; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to square; beaks narrow to midwide, obtuse, 0.5 mm. long; apical awns few, 3 to 15 mm. long; kernels pale red, usually short, ovate; germ midsized; crease usually midwide, shallow to middeep; cheeks rounded to angular; brush midsized, midlong. Spikes, glumes, and kernels of this wheat are shown in Plate XIX, *A*.

History.—The origin of Fultz wheat has been recorded by Carleton (*61*, p. 199–200), as follows:

> In 1862, in Mifflin County, Pa., Abraham Fultz, while passing through a field of Lancaster wheat, which is an awned variety, found three spikes of awnless wheat. He sowed the seed from these spikes the same year and continued sowing a larger amount each year until he obtained sufficient seed to distribute it pretty well over the country. It soon became a well-marked and popular variety called Fultz, from the name of the breeder. In 1871 the United States Department of Agriculture distributed 200 bushels of the wheat for seed.

Distribution.—Grown in Alabama, Arkansas, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia, and Wisconsin. The distribution is shown in Figure 31.

Synonyms.—Ber Ban, Bluestem, Bluestem Fultz, Economy, Everitt's High Grade, Grains o'Gold, Halver, Hickman, High Grade, Improved English, Improved Fultz, Jersey Fultz, Little Red Jersey, McKennon, New Economy, Nixon, Perpetuated Fultz, Roosevelt, Rust Proof, Shamrock, Slickhead, Tennessee Fultz, Tipton Red, and Winter Pearl.

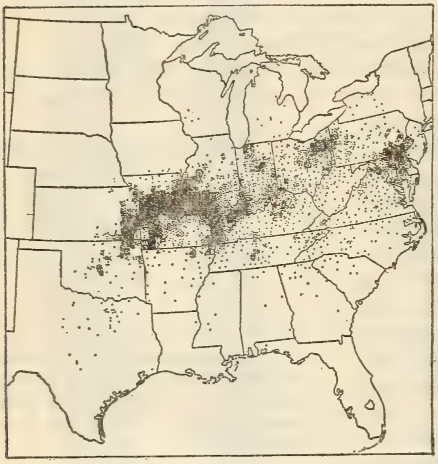


FIG. 31.—Outline map of a portion of the United States, showing the distribution of Fultz wheat in 1919. Estimated area, 4,801,100 acres.

Ber Ban is a name used for Fultz wheat in Campbell County, Tenn. Bluestem and Bluestem Fultz are names often used by farmers for Fultz wheat in the Ohio Valley, where the variety is extensively grown. Economy is the name under which a sample of wheat similar to Fultz was obtained in 1912 from the Cornell University Agricultural Experiment Station. A variety was grown under this name by the Ohio Agricultural Experiment Station as early as 1900. Its further history is undetermined. It is grown under this name in Kentucky, Ohio, and Virginia. New Economy is grown in Tennessee and may have the same or a different origin. Everitt's High Grade and High Grade are names first used for Fultz by J. A. Everitt in 1886, while a seedsman at Watertown, Pa. When distributed, the statement was made that it was a cross of "Martin's Amber on a number of other varieties." This statement attracted considerable comment at the time (*20*, p. 706), and as the crossing was begun only four years previous to distribution it was shown that the statement was absurd and that the wheat distributed was principally the Fultz variety mixed with several other wheats. The firm, however, continued to advertise and sell the wheat, but it was later advertised as "Everitt's High Grade, or Perpetuated Fultz." High Grade and Everitt's High Grade were reported grown in Illinois, Indiana, Kentucky, Maryland, Missouri, North Carolina, Ohio, Tennessee, Virginia, and West Virginia. Grains o'Gold also was in part Fultz wheat distributed by J. A. Everitt from his O. K. Seed Store, Indianapolis, Ind. It apparently was a mixture of Fultz, Gipsy, and several other varieties. It was reported grown in Kentucky, Missouri, Ohio, Tennessee, and West Virginia. Halver and Roosevelt are names used for a wheat very similar to Fultz in Pike and Gibson Counties, Ind., where it has been grown for six years in the vicinity of Stendal. One sample differed from Fultz in having a laxer and thicker spike which nodded. Hickman is the name of a variety similar to Fultz, the origin of which is undetermined. It was grown by the Ohio Agricultural Experiment Station for the first time in 1892. It possibly is a strain of Fultz wheat named for Prof. J. Fremont Hickman, former agronomist at the Ohio station, after his death. It is grown in Indiana and Ohio. Improved English is a name used for a variety similar to Fultz, in Cheatham County, Tenn., where it is said to have been grown for 25 years and to constitute 10 per cent of the wheat crop in the vicinity of Pleasant View. Improved Fultz is a name used for the Fultz variety by Everitt's O. K. Seed Store, Indianapolis, Ind., and the variety was so reported from Illinois, Indiana, and Kentucky. Jersey Fultz is a name used for Fultz wheat in Kentucky and is thought to be only the Fultz variety grown from seed originally from New Jersey. Little Red Jersey is a name used for Fultz in Tennessee. McKennon is a name reported for Fultz wheat in Henry County, Tenn., where it has been grown for 15 to 20 years. Nixon is a name under which samples of wheat similar to Fultz have been obtained from the Cornell University, Indiana, and Ohio Agricultural Experiment Stations. The origin of the name is undetermined, and the name was not reported in the varietal survey. Rust Proof is used for a wheat similar to Fultz in York County, S. C., where it has been grown in the vicinity of Clover for three years. The name is reported for other varieties in other localities. Shamrock is used as a name for Fultz wheat in Preble County, Ohio, where it has been grown for eight years near Eldorado. Slickhead is used as a name for Fultz wheat in Graves County, Ky. Tennessee Fultz is still another name used for Fultz wheat by Everitt's O. K. Store, Indianapolis, Ind., because they obtained their stock of seed from a valley in the high mountains of eastern Tennessee. It was reported from Indiana and Missouri. Tipton Red is a wheat very similar to Fultz grown in Jefferson County, Ind. One sample differed from Fultz in being a little later and in having a broader spike. Winter Pearl is a local name for Fultz wheat in Georgia.

ASHLAND.

Description.—According to the Kentucky Agricultural Experiment Station (*32*), "Ashland is very similar in character to ordinary Fultz. It has the good milling qualities of Fultz, and in addition yields better, with better straw, and is fairly resistant to scab and other diseases."

History.—This variety was developed as a pure-line selection of Fultz at the Kentucky Agricultural Experiment Station, Lexington, Ky., and was distributed to farmers in 1919 and 1920.

Distribution.—Grown to a limited extent in Kentucky in 1920.

TRUMBULL.

Description.—Trumbull differs from Fultz in being taller and in having a stronger and less purple straw and more erect spikes.

History.—Trumbull is a pure-line selection of Fultz, which was developed at the Ohio Agricultural Experiment Station, Wooster, Ohio. The selection was grown at the Ohio Agricultural Experiment Station as early as 1908. After eight years of experiments with the variety at Wooster, Prof. C. G. Williams wrote as follows regarding it:

> The other new introduction is the Trumbull, a pure-line selection of the Fultz. Wherever the Fultz wheat is found satisfactory, the Trumbull should succeed. It may be expected to yield 2 to 4 bushels per acre more than the Fultz. It possesses the quality of all pure lines—greater uniformity than the bulk seed, is fair in bread making, and among the good ones in stiffness of straw (*205*, p. 466).

Distribution.—Grown in Crawford, Monroe, and Pickaway Counties, Ohio.

FULTZO-MEDITERRANEAN.

Description.—Plant winter habit, midseason, midtall; stem purple, strong; spike awnless, clavate, dense, erect; glumes glabrous, white, midlong, midwide, easily shattered; shoulders wanting to narrow, oblique; beaks wide, obtuse, 1 mm. long; apical awns several, 1 to 10 mm. long; kernels red, short to midlong, soft, ovate; germ midsized; crease narrow to midwide, shallow to middeep; cheeks usually rounded; brush midsized, midlong.

This variety is very distinct from Fultz in having very strong stems and erect, dense, clavate spikes.

Spikes, glumes, and kernels are shown in Plate XIX, *B*.

History.—The origin of Fultzo-Mediterranean is not definitely known. Many synonyms are used for the variety, one of which may be the original name. The variety was first distributed as Fultzo-Mediterranean by Everitt's O. K. Seed Store, Indianapolis, Ind., in 1898. The variety was evidently named by that firm, and it is claimed by them to have originated from a cross between Fultz and Mediterranean. The following statement concerning its origin was made in their catalogue in 1899 (*89*, p. 8):

> MARRIED.—Two Noble Old Families Joined in Wedlock—Mr. Fultz to Miss Mediterranean. Their first-born is well named, Fultzo-Mediterranean, and is a worthy offspring from Noble Stock.

Fultzo-Mediterranean shows no indication of having been derived from Mediterranean, although it has many of the characters of Fultz. Neither of the alleged parents has the clavate spike of the Fultzo-Mediterranean.

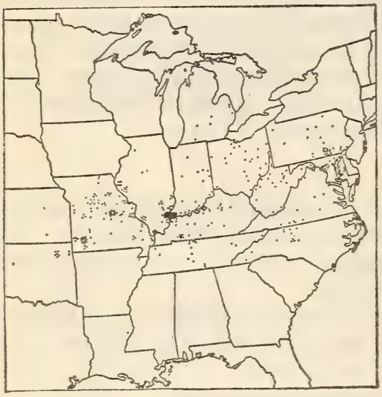


FIG. 32.—Outline map of a portion of the eastern United States, showing the distribution of Fultzo-Mediterranean wheat in 1919. Estimated area, 287,900 acres.

Distribution.—Grown in Delaware, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Missouri, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia. The distribution is shown in Figure 32.

Synoyms.—Burrhead, Club, Club Head, Columbia, Double Head, Duck Bill, Early Ontario, Economy, Farmers Pride, Flat Top, Four-Row Fultz, Harper, New Columbia, Scott's Squarehead, Square Head, Square Top, and Stub Head. Of these, the names Burrhead, Club, Club Head, Double Head, Duck Bill, Flat Top, Square Head, Square Top, and Stub Head are names used for Fultzo-Mediterranean in several of the Eastern States, particularly North Carolina, Virginia, and West Virginia. In that section it is often wrongly referred to as Club wheat. The names Columbia and New Columbia are known to be old names for the variety. In fact, the latter name was used for the variety by Everitt in the same year he first distributed it as Fultzo-Mediterranean and evidently also before that time, as the following quotation is from the same catalogue as the quotation given above:

> An Illinois production and first made public the year of the great World's Fair. Too much can not be said in its praise for hardiness, vigorous growth, and productiveness. In short, it has great merit and is entitled to be called our national wheat, as it bears our national name. Smooth head, white chaff, plump red grains. Wherever sown it makes friends. (*89*, p. 11.)

New Columbia was reported grown in Illinois, Indiana, Kentucky, Missouri, North Carolina, Ohio, and Tennessee.

Early Ontario is the name under which wheat similar to Fultzo-Mediterranean was obtained from the Ohio Agricultural Experiment Station in 1916.

A wheat of unknown characters was obtained under that name by the United States Department of Agriculture in 1902 from William Rennie, seedsman, of Toronto, Canada. Early Ontario was not reported in our varietal survey. Economy is a name used on farms for Fultzo-Mediterranean, as well as for the Fultz variety. Farmers Pride is a local name used for Fultzo-Mediterranean in Missouri.

Four-Row Fultz is a name under which Fultzo-Mediterranean was advertised and sold by A. H. Hoffman, seedsman, of Landisville, Pa. Our sample from that source was obtained in 1913. Four-Row Fultz was reported grown in Pennsylvania.

Scott's Squarehead is the name under which a sample of wheat similar to Fultzo-Mediterranean was obtained from the Kansas Agricultural Experiment Station in 1916. Its further history is undetermined and it was not reported in the survey.

KINNEY.

Description.—Plant spring habit, late, midtall; stem very glaucous before maturity, white, strong; spike awnless, oblong, middense, erect to inclined; glumes glabrous, white, midlong, wide; shoulders midwide, oblique to square; beaks wide, acute, 1.0 mm. long; apical awns several, 3 to 20 mm. long; kernels red, usually short, soft, broadly ovate, humped; germ midsized; crease midwide to wide, shallow to middeep; cheeks usually angular; brush midsized, midlong.

This variety is distinct from most others in being very glaucous during its growing period. It is a hardy spring wheat and is grown from both fall and spring seeding in the Willamette Valley of Oregon.

History.—According to H. Barendrick, of the Albina Fuel Co., Portland, Oreg., Kinney wheat was introduced into the Willamette Valley of Oregon from France in the late sixties or early seventies by Albert Kinney, son of Robert Kinney, who operated a flour mill in that section. Albert Kinney was selling flour for his father in France, and introduced the wheat, which later became known as Kinney, because he thought that it would be a better milling wheat than the varieties then grown in the Willamette Valley. This did not prove to be the case, however, and many people found fault with the miller later when the wheat was found to be of rather inferior milling quality and brought a slightly lower price than White Winter, the variety most commonly grown. Nothing is known concerning the French name for the Kinney variety.

Distribution.—Grown in Benton, Lane, Linn, Marion, Polk, and Washington Counties, Oreg.

Synonyms.—Noah Island, Odessa, Surprise. These are names recorded by Hyslop (*126*, p. 674) as synonyms used for Kinney wheat in the Willamette Valley of Oregon.

PURPLESTRAW.

Description.—Plant spring habit, early, midtall; stem purple, midstrong; spike awnless, fusiform, middense, inclined to nodding; glumes glabrous, white, short to midlong, midwide; shoulders narrow to midwide, oblique to square; beaks wide, obtuse, 0.5 to 1.0 mm. long; apical awns several, 3 to 10 mm. long; kernels red, short to midlong, soft, ovate or sometimes nearly oval; germ midsized; crease midwide, shallow to middeep; cheeks usually rounded; brush small to midsized, midlong.

This variety is fairly hardy and has been grown from fall sowing in the Southeastern States for many years. Its principal advantage over other varieties in that section is its early maturity, which in part is due to its spring habit. Plate XVIII, *B*, shows spikes, glumes, and kernels of this variety.

History.—The origin of Purplestraw wheat is undetermined. It is, however, one of the earlier varieties of wheat grown in the United States. Concerning its early culture, the following information has been recorded by Edmund Ruffin:

> From 1822 to the present time the same kind of wheat has been cultivated, first known as Mountain Purplestraw and more lately designated Early Purplestraw (*161*, p. 103).

As the variety has continued to be an important wheat in the southeastern United States, its successful culture has continued about 100 years.

Distribution.—Grown in Alabama, Arkansas, Connecticut, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia. The distribution is shown in Figure 33.

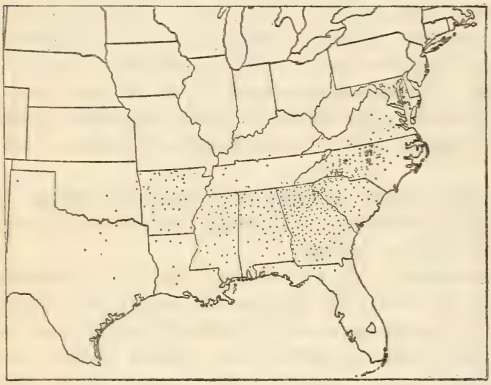


FIG. 33.—Outline map of the southeastern United States, showing the distribution of Purplestraw wheat in 1919. Estimated area, 273,800 acres.

Synonyms.—Alabama Bluestem, Bluestem, Early Purplestraw, Georgia Bluestem, Georgia Red, Mountain Purplestraw, and Ripley.

Alabama Bluestem is a name commonly used for Purplestraw wheat in Alabama. Bluestem is the general name used as a synonym for Purplestraw by many growers of the variety in the Southeastern States. Early Purplestraw is a name, as indicated above, which was formely used for the variety. In recent years, however, the word "early" has been dropped, and Purplestraw has become the name most generally used. Georgia Bluestem and Georgia Red are names commonly used by growers of Purplestraw wheat in Georgia. Mountain Bluestem, as stated above, was the name under which the variety was first grown. This name is still used in some sections, although the prefix "Mountain" has generally been dropped for many years. Ripley is a local name used for Purplestraw in York County, S. C.

HUSTON.

Description.—Plant spring habit, early, midtall; stem faintly purple, midstrong; spike awnless, oblong, dense, erect; glumes glabrous, white, midlong, midwide, easily shattered; shoulders wanting to narrow, oblique; beaks narrow, obtuse, 1.0 to 1.5 mm. long; apical awns several, 3 to 10 mm. long; kernels red, short, soft to semihard, broadly ovate; germ midsized; crease midwide, shallow to middeep, usually pitted; cheeks rounded, brush small, midlong, sometimes collared.

This is one of the few soft red spring-wheat varieties grown in the United States.

History.—According to S. L. Williams, of the Eugene Mill & Elevator Co., Eugene, Oreg., the variety was introduced in the vicinity of Eugene in 1876 by a Mr. Belshaw, who obtained a sample of the wheat at the Centennial Exposition, where it was on exhibition as Bulgarian Red Spring. He sowed the few kernels in his garden and in this way obtained sufficient seed to sow 5 acres. His land was low and heavy, however, and the wheat did not prove satisfactory, so he gave the seed to a Mr. Huston living 16 miles west on the hill lands, who grew it with splendid success and the wheat came to be known as Huston.

Distribution.—Grown in Benton, Douglas, Lane, Linn, Marion, Polk, and Yamhill Counties, Oreg.

Synonyms.—Bulgarian, Early Wonder, Grass, Little Red, Ninety-Day, Red Spring, and Swamp.

Bulgarian, as indicated above, was the name under which the variety was known before it was introduced in Oregon, and the name is still used in Linn County, Oreg. Early Wonder was recorded by Hyslop (*126*) as a synonym for Huston and is much used for the Huston variety in Benton, Linn, and Polk Counties, Oreg. Grass, Little Red, Ninety-Day, Red Spring, and Swamp are also local names used for Huston by farmers in the Willamette Valley of Oregon.

ALTON (GHIRKA WINTER).

Description.—Plant winter habit, midseason, midtall; stem white, midstrong; spike awnless, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to square; beaks wide, acute, 1 mm. long; apical awns few, 3 to 10 mm. long; kernels red, usually short, hard, ovate; germ very small; crease narrow to midwide, shallow; cheeks rounded; brush midsized, midlong.

This variety is the only awnless hard red winter wheat grown commercially in the United States. It usually yields somewhat less than Turkey and its milling and bread-making value is also slightly less than that of Turkey.

History.—Alton was introduced by the United States Department of Agricultrue (*197*) as Ghirka Winter in December, 1900, from Altonau, near Melitopol in northern Taurida, Russia (S. P. I. No. 5637). It was one of a large number of wheat varieties introduced by M. A. Carleton, department cerealist, who went to Russia and Siberia in 1898 and again in 1900 for the purpose of obtaining cereal crops.

This variety proved best adapted in Wyoming and Colorado, where it has been distributed in a small way. The name Alton is here substituted for Ghirka Winter to avoid confusion with the variety of spring wheat known as Ghirka Spring. The name Alton is derived from Altonau, the original source of the sample.

Distribution.—Grown as Ghirka Winter to a limited extent in Colorado, Kansas, and Wyoming.

RED BOBS.

Description.—Plant spring habit, early, midtall; stem white, strong; spike awnless, fusiform, middense, erect; glumes glabrous, white to yellowish, midlong, midwide; shoulders wide, oblique to square; beaks wide, acute, 0.5 mm. long, sometimes nearly wanting; apical awns entirely wanting; kernels red, usually short, hard, oval to ovate, with truncate tip; germ midsized; crease midwide to wide, middeep to deep; cheeks angular; brush midsized, short.

This variety has two types of plants, but differs from Bobs principally in having red kernels. In the northern spring-wheat sections of the United States Red Bobs has proved very susceptible to stem rust. Spikes, glumes, and kernels of the variety are shown in Plate XX, *A*.

History.—The Red Bobs originated from a head selection made in a field of Bobs wheat by Seager Wheeler in 1910 at Maple Grove Farm, Rosthern, Saskatchewan. It was distributed for the first time in 1918, and its history was recorded the following year by Mr. Burns in the National Alfalfa Journal (*55*). A fuller history of this variety has been recorded by Buller (*50*, p. 259–275). It is evidently the result of a natural field hybrid between Bobs and a red-kerneled variety.

Distribution.—Grown at several experiment stations in the northwestern United States and commercially in Canada and probably to a limited extent in the Dakotas and Minnesota in 1920, as the seed has been advertised for sale for three years. It was not reported in the varietal survey.

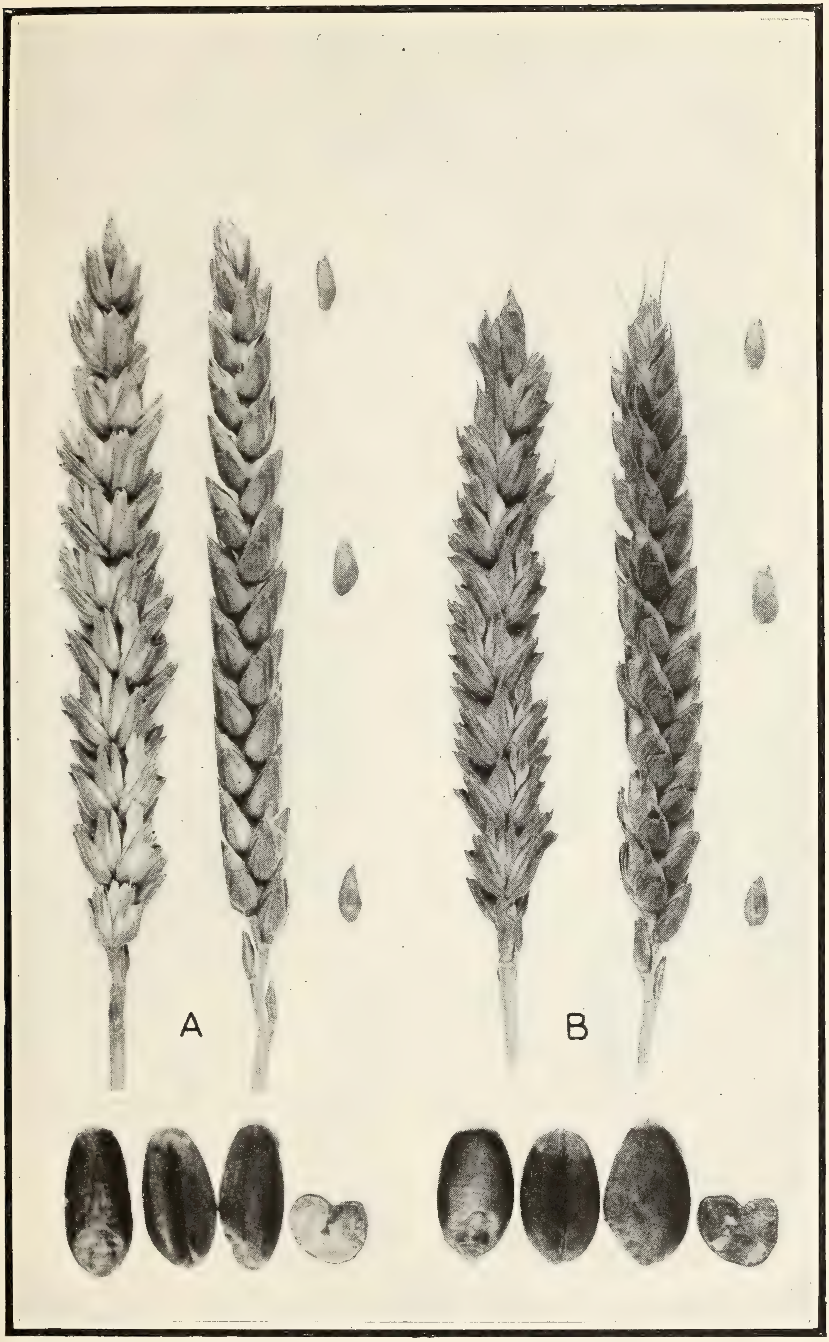
MARQUIS.

Description.—Plant spring habit, early, short to midtall; stem white, strong; spike awnless, fusiform, dense, erect; glumes glabrous, white to yellowish, short, wide; shoulders midwide to wide, usually square; beaks wide, acute, 0.5 mm. long; apical awns few, 1 to 10 mm. long; kernels red, short, hard, ovate, with truncate tip; germ midsized; crease wide, deep; cheeks angular; brush midsized, midlong.

This is a high-yielding spring wheat, and it is one of the best varities for milling and bread making. Its high yield and popularity are due principally to its early maturity, which has sometimes enabled it to escape stem rust and drought. Spikes, glumes, and kernels are shown in Plate XXI, *A*.

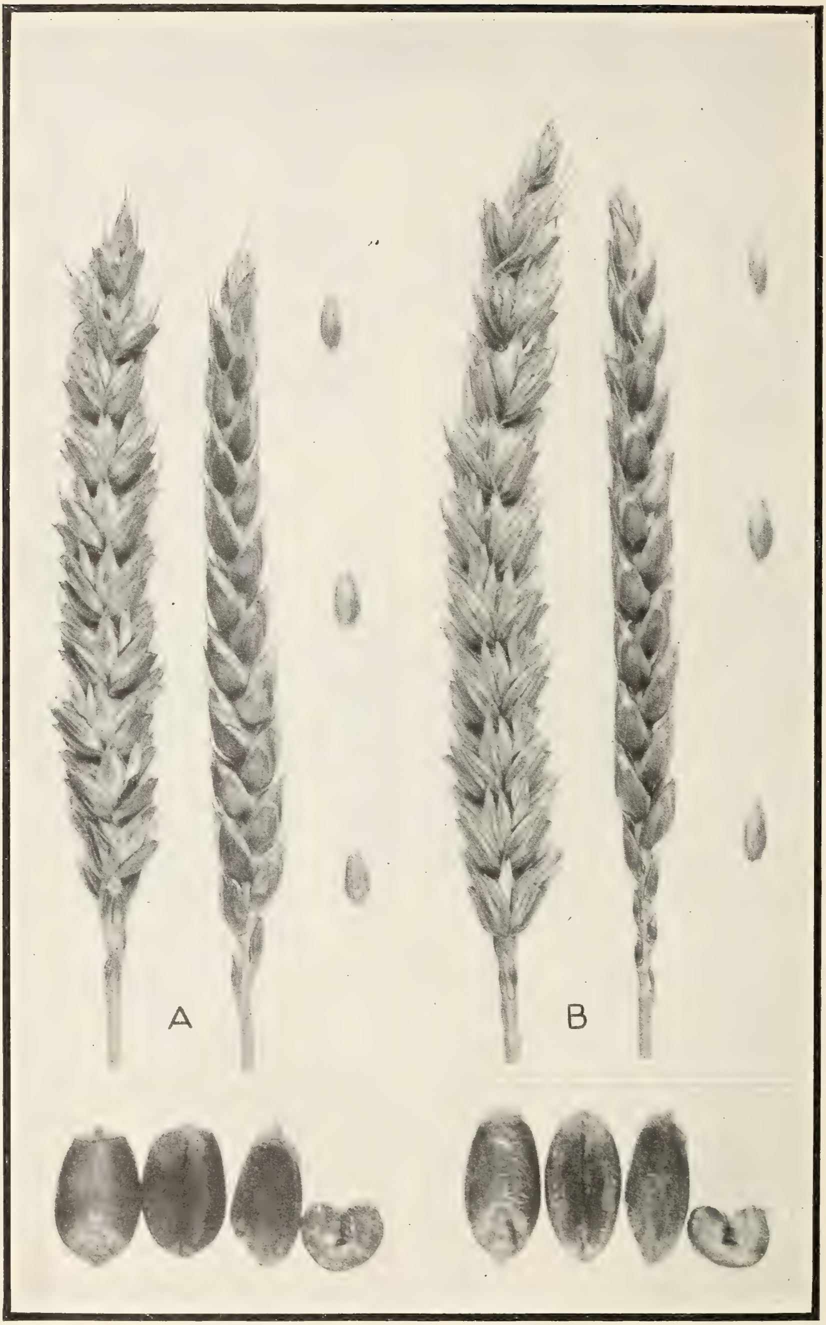
History.—Marquis is of hybrid origin, having been originated by the cerealists of the Dominion Department of Agriculture at the Central Experimental Farm, Ottawa, Canada. The crossing which resulted in the origin of Marquis was done under the direction of Dr. William Saunders, former Dominion cerealist. To the present Dominion cerealist, Dr. C. E. Saunders, the credit for originating (selecting, naming, testing, and distributing) the variety is due. He has given an account of its origin in the following words (*167*, p. 118–120):

> All the details in regard to the origin of Marquis are not available, but it is one of the descendants of a cross between an early-ripening Indian wheat, Hard Red Calcutta (as female) and Red Fife (as male). The cross (as appears from unpublished notes) was made by Dr. A. P. Saunders, probably at the experimental farm at Agassiz, in the year 1892. The crossbred seeds, or their progeny, were transferred to Ottawa and when the writer of this report was appointed in 1903 to take charge of the work of cereal breeding he made a series of selections from the progeny of all the crossbred wheats which had been produced at Ottawa up to that time. Some of these had been named and others were under numbers. Though they had all been subjected to a certain amount of selection, each of them consisted of a mixture of related types. In some cases all the types present were similar. In other instances striking differences were observed. The grain which had descended from the cross referred to above was found by careful study of individual plants (especially by applying the chewing test to ascertain the gluten strength and probable bread-making value) to be a mixture of similar looking varieties which differed radically in regard to gluten quality. One of the varieties isolated from this mixture was subsequently named Marquis. Its high bread-making strength and color of flour were demonstrated in the tests made at Ottawa in the early months of 1907, and all the surplus seed was at once sent to the Indian Head Experimental Farm for propagation.
>
> It will be clearly seen from the above account that the question, "When was Marquis wheat originated?" can never be answered. It came into existence probably at Ottawa between the years 1895 and 1902. It remained, however, mixed with other related sorts until discovered by the writer in 1903. It was first grown in a pure state in 1904, when a few seeds were sown in a sheltered garden on the Central Experimental Farm. Even then, however, its fine qualities were only partly known, and it was not until the cerealist's baking tests of 1907 were completed that he decided to send out this wheat for trial in Saskatchewan. Its success in the prairie country was phenomenal.



RED BOBS (A). KITCHENER (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



MARQUIS (A). RED FIFE (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

Marquis wheat was first sent to the Prairie Provinces of Canada in 1907, where it was thoroughly tested at experiment stations. At Indian Head and Rosthern, Saskatchewan, and at Brandon, Manitoba, it very significantly outyielded all other varieties. By 1911 the variety had become commercially established in Canada.

Attention was first attracted to Marquis wheat in the United States through its having won premiums at several expositions. Seed was introduced by the United States Department of Agriculture in 1912 and 1913, and the variety was thoroughly tested at numerous experiment stations in the spring-wheat sections. These and other experiments, reported by Ball and Clark (*40*, *41*), proved the variety to be widely adapted. In the meantime, in consequence of much publicity, a strong demand for seed arose. A considerable quantity was brought into the country for sowing in 1913. Much larger quantities were imported in 1914. The importations of these two years, with the seed home grown in 1913, were sufficient to sow about half a million acres in 1914. Most of the imported seed was sold in Minnesota, North Dakota, and Montana. Smaller quantities were sold in other spring-wheat States. In this way the Marquis variety became widely distributed in a very short time. In 1919, only seven years after its introduction, it made up at least 60 per cent, or nearly 12,000,000 acres, of the total spring-wheat acreage of the United States.

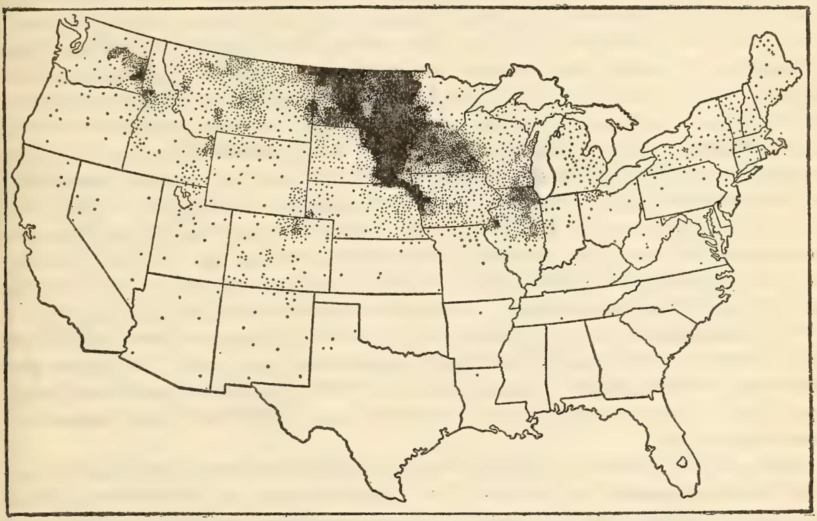


FIG. 34.—Outline map of the United States, showing the distribution of Marquis wheat in 1919. Estimated area, 11,825,200 acres.

Distribution.—Grown in Arizona, Arkansas, California, Colorado, Connecticut, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming. This wide distribution is due partly to emergency conditions, because of the World War. Normally spring wheat is not so widely grown. The distribution of Marquis wheat in 1919 is shown in Figure 34.

RED FIFE.

Description.—Plant spring habit, midseason, midtall; stem white, strong; spike awnless, fusiform, middense, erect to inclined; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to square; beaks narrow, acute, 0.5 to 1.0 mm. long; apical awns few, 2 to 5 mm. long; kernels red, short to midlong, hard, ovate; germ midsized; crease wide, deep; cheeks angular; brush midsized, midlong.

This variety differs from Marquis in being taller and later, with kernels slightly longer and more pointed. It is a fairly good yielder and an excellent milling and bread-making wheat. Spikes, glumes, and kernels of Red Fife wheat are shown in Plate XXI, *B*.

History.—Red Fife wheat was introduced into the United States from Galicia, by way of Germany, Scotland, and Canada. Several conflicting stories of its introduction have been written. The most authentic story is that, about 1842, David Fife, of Otonabee, Ontario, Canada, received a small sample of wheat from a friend in Glasgow, Scotland. The friend had obtained the sample from a shipload of wheat from the port of Danzig in Germany, but supposedly of Russian origin. Mr. Fife sowed the wheat in the spring, but it proved to be a winter wheat. A plant of spring wheat developed, however, which was saved and increased. From it descended the wheat which became known as Red Fife throughout Canada. The details of this introduction and several interesting traditions concerning it have been fully recorded by Buller (*50*, p. 206–218). That the original seed of Red Fife wheat probably came from Galicia has been established by two other identical introductions, one by the Canadian Department of Agriculture in 1904 (*165*, p. 216–217), and another (C. I. No. 2463) by the United States Department of Agriculture in the same year (*39*, p. 11).

The cultivation of Red Fife wheat in the United States dates from 1860, when J. W. Clarke, a Wisconsin farmer, had an excellent crop (*68*). The name Red Fife was never commonly adopted, the word "Fife" being the name most often used. As the wheat increased in popularity and cultivation, other names became applied to it.

Many growers selected and distributed the Red Fife wheat and usually prefixed their own name to the name Fife. Among these are the following: Bernard Fife, Herman Fife, McKendry Fife, McKissick Fife, Pillsbury Fife, Verdon Fife, and Wilcox Fife. Wheats once known under these names have long since disappeared from culture.

Distribution.—Grown as Fife in Idaho, Illinois, Iowa, Maine, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Hampshire, New York, North Dakota, Oklahoma, Oregon, Pennsylvania, South Dakota, Utah, Vermont, Wisconsin, and Wyoming. This distribution combined with that of the Power and Glyndon varieties is shown in Figure 35.

Synonyms.—Canadian Fife, Fife, Saskatchewan Fife, Scotch Fife. Canadian Fife and Scotch Fife are names which were early used for the Red Fife wheat in the United States. Both these names have continued in use until the present time.

Saskatchewan Fife is a selected strain of Red Fife distributed by D. L. Wellman, of Frazee, Becker County, Minn., in 1878. Mr. Wellman received a pint package of Red Fife wheat from W. J. Abernethy, agricultural editor of the Pioneer Press, St. Paul, Minn. He grew this wheat for a number of years and selected it carefully, roguing out all mixtures. In the fall of 1883 he had a stock of 1,300 bushels which he put on the market as Saskatchewan Fife (*201*). This wheat in a few years became well known and quite widely grown and is still in cultivation. It was reported grown in New Jersey, Pennsylvania, and South Dakota.

POWER.

Description.—Power is slightly shorter and has a more erect spike than Red Fife, and the kernels are slightly shorter. A spike of Power wheat is shown in Plate VI, Figure 3.

History—Power is a pure-line selection of Red Fife wheat which was started about 1885 by James Holes, of Fargo, N. Dak., from a single plant of Red Fife wheat found growing in an oat field (*39*, p. 11). Some of this seed was obtained by J. B. Power, of Power, N. Dak., who increased it and distributed it in large quantities under the name of Power Fife. This strain was grown by the North Dakota Agricultural Experiment Station and known as Station No. 66. A number of pure-line selections were made from it at the North Dakota Experiment Station in 1892. One of these pure lines, known as North Dakota No. 313 (C. I. No. 3697), has been called Power, and is the strain now most commonly grown. In experiments at the Williston substation, Williston, N. Dak., it proved to be a high-yielding wheat for that section, and seed was recently increased and distributed in the vicinity of that station.

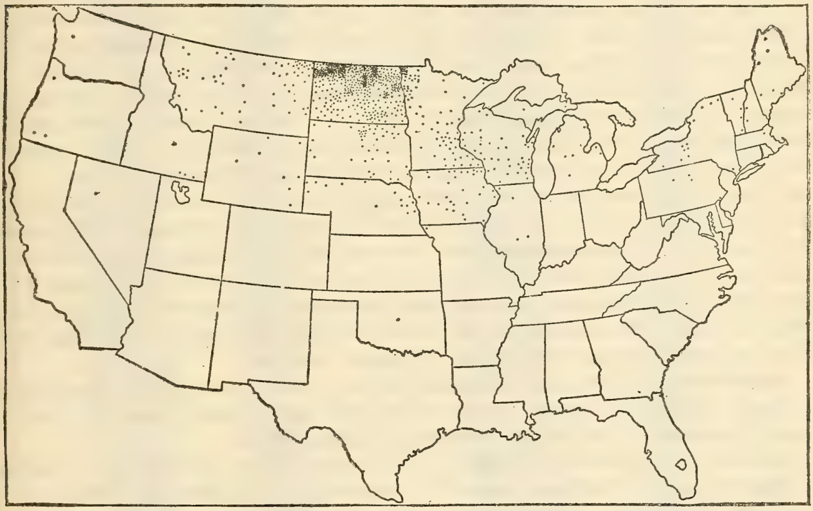


FIG. 35.—Outline map of the United States, showing the distribution of Red Fife wheat in 1919. Estimated area, 750,000 acres.

Distribution.—Grown in Montana and North Dakota.

Synonyms.—Power's Fife, Station No. 66.

GLYNDON.

Description.—Plant spring habit, midseason, midtall to tall; stem white, midstrong; spike awnless, fusiform, middense to lax, inclined; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to square; beaks narrow, acute, 0.5 to 1.0 mm. long; apical awns few, 3 to 15 mm. long; kernels red, midlong, hard, ovate; germ midsized; crease wide, deep; cheeks angular; brush midsized, midlong.

Glyndon differs from Red Fife and Power principally in having longer and laxer spikes. Spikes, glumes, and kernels of Glyndon wheat are shown in Plate XXII, *A*.

History.—This strain of Fife wheat dates from about 1891, when it was first grown by the Minnesota Agricultural Experiment Station as No. 811, at the Glyndon farm in western Minnesota. In the burning of the Glyndon station buildings all records of its origin were lost. Without doubt, however, it is one of the many samples of Red Fife wheat obtained from Minnesota farmers in 1888 and 1889. In 1892 the breeding of eight of the best varieties of wheat which had been selected by the Minnesota station was begun by continuous selection, known as the centgener system, by W. M. Hays, then at the North Dakota Agricultural Experiment Station. Four hundred selected kernels of the eight varieties which had been grown at Glyndon, Clay County, in the previous year were sown at Fargo, N. Dak., and a like number on the farm belonging to J. B. Power & Sons, of Power, Richland County, N. Dak. Some of these selections were from No. 811. All of the selections were grown at Fargo again in 1893. From the 400 selected kernels, 31 plants having the largest yield and of superior quality were chosen for seed the next season. In 1893, 100 to 400 kernels from each of these 31 plants were sown at Fargo in a manner similar to the method used in 1892. In 1893, the best plant was chosen from the progeny of each of the 31 plants above mentioned. One selection made that year from No. 811 was accessioned as Minnesota No. 163. This selection, with many others, was sown at the University Farm, St. Paul, Minn., in 1894, in a small plat. In 1895 and 1896, 31 strains were tested at University Farm, and 8 were selected and grown at other stations. Among them was Minnesota No. 163. After further testing, this strain was selected as the best of the Fife types and seed was increased and distributed to farmers in 1898 (*109*, p. 105). It was first distributed as Minnesota No. 163, but in 1915 the name Glyndon was assigned to it by the Minnesota station.

Distribution.—Grown in Minnesota, North Dakota, and South Dakota. It is grown most in Minnesota, where it was once an important wheat. In recent years, however, it has largely disappeared from culture.

Synonyms.—Minnesota No. 163. As indicated above, this is the Minnesota accession number which was used as a name for the variety from 1898, when it was first distributed, until 1915, when it was named Glyndon.

RYSTING.

Description.—Rysting is a strain of Fife wheat apparently identical with Glyndon. It has not yielded as well as Glyndon in some sections, while in others it has done as well or better.

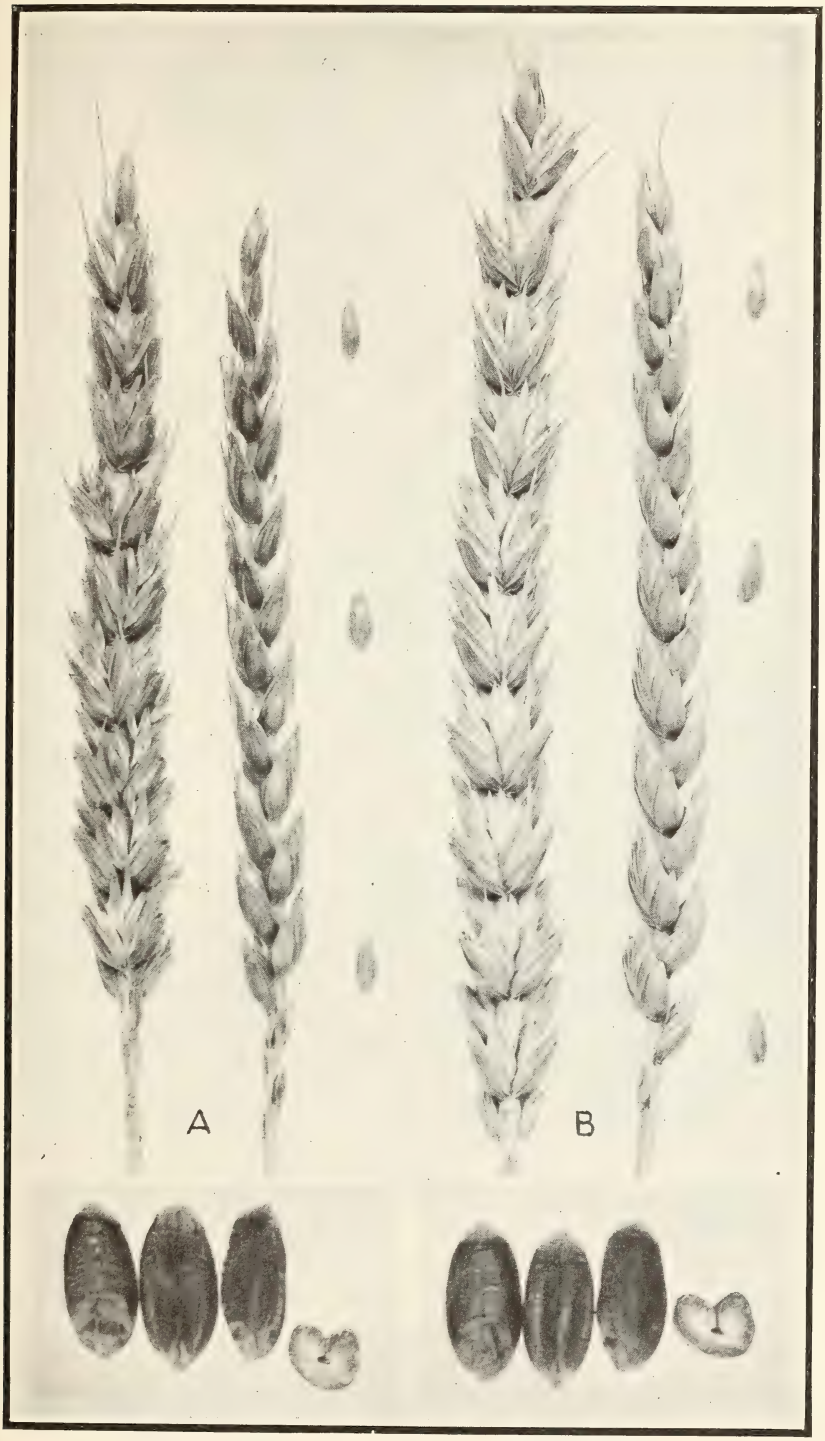
History.—Rysting was selected, increased, and distributed about 1892 by Jens Rysting, of Buxton, N. Dak. (*39*, p. 12). Mr. Rysting claimed that it was earlier than the ordinary Red Fife.

Distribution.—This strain is still grown in experiments at several stations in the northern spring-wheat area and probably commercially in North Dakota. Its commercial distribution, however, can not be separated from that reported for other Fife wheats.

Synonym.—Rysting's Fife.

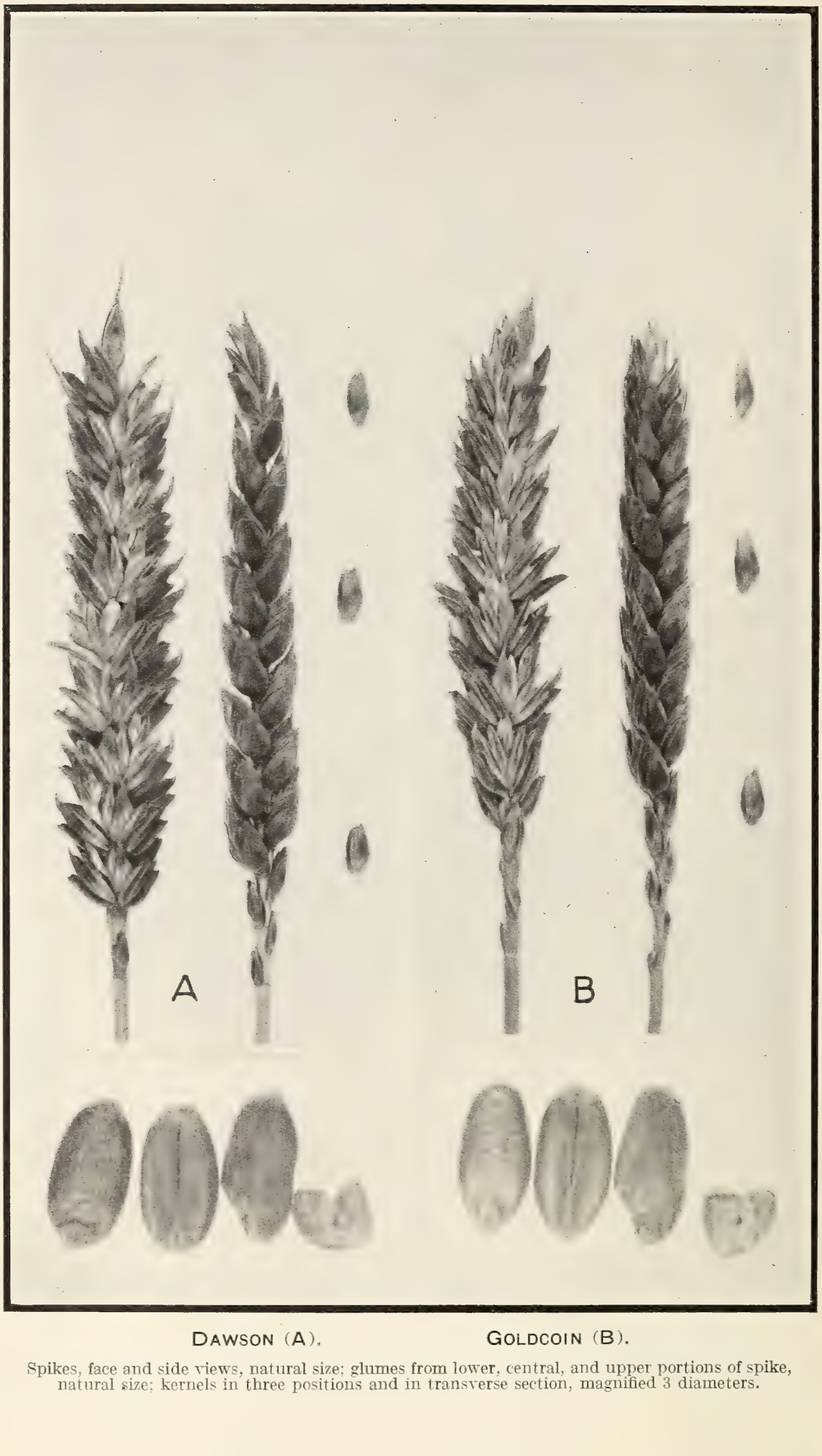
WELLMAN (WELLMAN'S FIFE).

Description.—Plant spring habit, midseason, midtall to tall; stem white, midstrong; spike awnless, linear-fusiform, lax (68 to 75 mm. per 10 nodes) in-



GLYNDON (A). WELLMAN (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



DAWSON (A). GOLDCOIN (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

clined, long (8 to 13 cm.); glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to square; beaks narrow, acute, 1 mm. long; apical awns few, 3 to 6 mm, long; kernels red, short, semihard, ovate, with truncate tip; germ midsized; crease wide, deep; cheeks angular; brush midsized, midlong.

Wellman differs from Red Fife and Glyndon in being slightly taller and having a much longer and laxer spike and a shorter and softer kernel. Plate XXII, *B*, shows spikes, glumes, and kernels of this variety.

History.—Wellman (Wellman's Fife) wheat was developed by D. L. Wellman, of Frazee, Becker County, Minn., from a plant selected out of Red Fife wheat which he called Scotch Fife, the original sample having been obtained from the "Saskatchewan Valley" in Canada. The original sample was a mixture. Several strains from it were grown, and this strain, which was taller and had a much longer and laxer spike, was increased and distributed for the first time, in the spring of 1884, as Wellman's Fife (*20*). A variety called White Russian was grown by the Colorado Agricultural Experiment Station (*46*, p. 40) as early as 1879 and by the Indiana Agricultural Experiment Station in 1884 (*136*, p. 54). It was grown in varietal experiments at Indian Head, Saskatchewan, for the first time in 1891, while Wellman's Fife was grown at the same station the year previous. The two varieties are identical and have always been considered as synonymous in Canada. It is probable that Mr. Wellman only selected a chance head of this White Russian wheat from his Canadian mixture.

Distribution.—Wellman's Fife was quite widely grown in the northern Great Plains and Minnesota and in the New England States and New York during the nineties, but since has practically disappeared from cultivation. It was reported from Aroostook County, Me.

Synonyms.—Saskatchewan Fife and White Russian. Saskatchewan Fife was advertised during the nineties as a synonym of Wellman's Fife by Peter Henderson & Co., seedsmen, of New York City (*110*). As indicated above, White Russian is an older name for this variety than Wellman and is still used in Canada.

EARLY RED FIFE.

Description.—Plant spring habit, early to midseason, midtall; stem usually white, sometimes showing a faint tinge of purple, strong; spike awnless, linear-oblong, sometimes becoming subclavate; middense, erect; glumes glabrous, yellowish white, midlong, narrow to midwide; shoulders wanting to narrow, oblique; beaks narrow, obtuse, 1 mm. long; apical awns several, 3 to 30 mm. long; kernels red, midlong, hard, ovate; germ midsized; crease midwide to wide, shallow to deep; cheeks angular; brush midsized, midlong.

Early Red Fife differs from other Fife strains in being earlier and in having a linear-oblong instead of a fusiform spike. The kernels also have a somewhat shallower crease.

History.—This is an early-ripening selection of Red Fife wheat, made and developed by Dr. C. E. Saunders, Dominion cerealist, at the Central Experimental Farm, Ottawa, Canada, where it has been grown since 1908 (*166*, p. 202–203).

Distribution.—Grown commercially in Canada and experimentally in Montana and North Dakota.

GHIRKA (GHIRKA SPRING).

Description.—Plant spring habit, early, midtall; leaves pubescent; stem glaucous when immature, usually purple, sometimes only faintly so, midstrong; spike awnless, linear-fusiform, middense, inclined to nodding; glumes glabrous, white, long, narrow; shoulders wanting to narrow, oblique; beaks narrow, acute, 1 mm. long; apical awns few, 3 to 6 mm. long; kernels pale red, midlong, semihard, ovate to elliptical, slightly humped, acute; germ small to midsized; crease midwide to wide, middeep to deep; cheeks usually angular; brush small, midlong.

This variety differs from the true Fife strains in having a longer and more tapering spike and larger and softer kernels. It is a high-yielding, drought-resistant wheat, but is inferior to Fife strains for milling and bread making. A spike of this variety is shown in Plate V, Figure 1.

History.—Ghirka (Ghirka Spring) was an important variety in Russia, grown principally in southern Russia and the Volga River district. It was introduced into the United States several times during the period from 1898 to 1904, inclusive, eight lots having been imported by the United States Department of Agriculture. Other importations were made by Russian immigrants. Joseph Dukart, who settled at New England, N. Dak., brought a 2-pound lot from Russia in 1905. From the increase of this, several thousand acres were grown in western North Dakota from 1914 to 1916 (*65*, p. 2).

Distribution.—Grown sparingly, mostly under the name Russian, in North Dakota, South Dakota, Vermont, and Wyoming.

Synonyms.—Early Russian, Russian, and Russian Fife. The name Early Russian has long been used for Ghirka wheat in Canada. Russian and Russian Fife are names used by Russian settlers who grow the wheat in western North Dakota and South Dakota.

RUBY.

Description.—Plant spring habit, early, short; stem purple, strong; spike awnless, oblong-fusiform, dense, erect; glumes glabrous, yellowish white, short, midwide; shoulders wide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns several, 3 to 10 mm. long; kernels red, short, hard, ovate; germ midsized to large; crease midwide to wide, shallow to deep; cheeks angular; brush midsized, short.

Ruby differs from Marquis principally in being about five days earlier and in having purple straw. In preliminary experiments in the United States it has not compared favorably with Marquis in yield, but has equal milling and bread-making value.

History.—The Ruby variety was originated by Dr. C. E. Saunders, Dominion cerealist, at the Central Experimental Farm, Ottawa, Canada, and was distributed for the first time in 1917. The parentage of Ruby has been recorded by Buller (*50*, p. 186) as follows:

Gehun (f) × Onega (m) ....W. T. Macoun, 1891.
Downy Riga (f) × Red Fife (m).............C. E. Saunders, 1905.
Ruby.

Distribution.—Grown at several experiment stations in the northern spring-wheat sections of the United States since 1918 and commercially since 1920.

KITCHENER.

Description.—Plant spring habit, early to midseason, midtall to tall; stem purple, strong; spike awnless, oblong to subclavate, middense, erect; glumes glabrous, yellowish white, short, wide; shoulders midwide, oblique to square; beaks midwide, acute, 0.5 mm. long; apical awns few, 3 to 10 mm. long; kernels red, short, hard, ovate, with truncate tips; germ midsized; crease wide, middeep; cheeks angular; brush midsized, midlong.

Kitchener differs from Marquis in being taller and later and in having a broader spike, purple straw, and a slightly longer and more rectangular kernel. (Plate XX, *B*.)

History.—This variety originated from a head selected in a field of Marquis by Seager Wheeler in 1911 at Maple Grove Farm, Rosthern, Saskatchewan. It was increased and tested for yield by Mr. Wheeler for a period of four or five years and then distributed (*202*).

Distribution.—Grown at several experiment stations in the spring-wheat sections of the United States and commercially in Canada.

CLIMAX (JONES CLIMAX).

Description.—Plant winter habit, midseason to late, tall; stem white, midstrong; spike awnless, linear-fusiform, lax, nodding; glumes glabrous, white, midlong to long, midwide; shoulders wanting to narrow, oblique; beaks wide, obtuse, 1 mm. long; apical awns few, 3 to 10 mm. long; kernels red, midlong to long, soft, elliptical to ovate; germ midsized; crease midwide, middeep; cheeks usually rounded; brush midsized, midlong.

This variety is very distinct because of its long, lax, tapering, and nodding spike. Spikes, glumes, and kernels of this wheat are shown in Plate XVII, *B*.

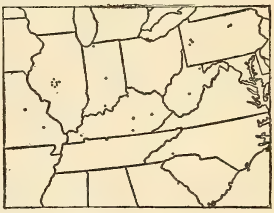


FIG. 36.—Outline map of the east-central United States, showing the distribution of Climax wheat in 1919. Estimated area, 16,800 acres.

History.—The origin of Climax (Jones Climax) is not definitely determined. It is very similar to the Celebrated K. B. No. 2 variety, differing only in having a more nodding spike. The latter wheat was distributed by the Knight & Bostwick Seed Co., Rochester, N. Y., who have given its history as follows:

> During the summer of 1898 we discovered growing in our field of Long Berry Clawson . . . a single head of wheat that showed qualities distinctly superior to its celebrated parent. . . . We sowed it in our trial grounds . . . called it our Celebrated K. B. No. 2 (*122*, p. 90).

Its distribution dates from 1902, although it apparently did not become widely grown. This or a very similar wheat evidently was rather recently named Jones Climax and distributed by Everitt's O. K. Seed Store, Indianapolis, Ind., and the commercial distribution of the variety was thus established. There seems to be no evidence that A. N. Jones, of New York, who developed several varieties of wheat, had anything to do with this variety.

Distribution.—Grown as Jones Climax in Georgia, Illinois, Indiana, Kentucky, Missouri, North Carolina, and West Virginia, and under the names of synonyms in Pennsylvania. The distribution is shown in Figure 36.

Synonyms.—Celebrated K. B. No. 2, Grecian, K. B. No. 2, Pennsylvania Standard, Wilson, and Wilson Special. As shown above, Celebrated K. B. No. 2 was possibly the original name. Most experiment stations grew and recorded it simply as K. B. No. 2. Grecian is a name used for the variety in Butler County, Pa., where it has been grown for about 10 years. Pennsylvania Standard is a name used for the variety in Schuyler County, Mo., where, according to W. J. Ford, of Glenwood, it has been grown for about 25 years and now constitutes 25 per cent of the wheat grown in the vicinity. Wilson and Wilson Special are names used for the variety in Marion County, Ind., and Lycoming County, Pa.

KOFOD.

Description.—Plant usually winter habit, sometimes intermediate or spring, midseason, midtall; stem white, slender, weak; spike awnless, fusiform, middense, nodding; glumes glabrous, yellowish, brown streaked, midlong, midwide; shoulders midwide, usually oblique to square but sometimes more variable; beaks usually wide, obtuse, 1 mm. long; apical awns few, 2 to 15 mm. long; kernels white, midlong, soft, ovate, acute; germ small to midsized; crease midwide, middeep; cheeks angular; brush midsized, midlong.

The characters of Kofod wheat are rather variable and unstable. The kernel is extremely soft.

History.—An interesting but probably mythical story regarding the origin of Kofod wheat was published in the Deseret Farmer in 1906 (*29*). According to the story, Amasa Potter, of Payson, Utah, in the year 1870 was exploring ancient mounds in Utah County, near Payson, in one of which he found two skeletons and, among other things, a small quantity of wheat. Most of the grain had decayed, but a few apparently sound kernels remained. These he sowed, and increased and distributed the resulting yield. The published correspondence further shows that he let Orwell Simons, of Payson, Utah, have some of the seed, and he in turn let Peter Winward, of the same place, have some. A John C. Whitbeck obtained some of the seed from Peter Winward in 1875 and took it to Levan, Utah. Hans C. Kofod, of Levan, later obtained seed of this wheat from Mr. Whitbeck and thus got the start of what is now known as Kofod wheat. The fact that wheat usually loses its viability after 10 or 15 years makes this story of its ancient origin extremely improbable.

Distribution.—Grown in Iron, Juab, Millard, and Sanpete Counties, Utah.

Synonym.—Koffoid. This is the name under which this wheat has been grown and referred to in previous publications by the United States Department of Agriculture and by the Utah Agricultural Experiment Station until 1919. The name was changed to Kofod upon learning the correct spelling of Mr. Kofod's name.

DAWSON (DAWSON GOLDEN CHAFF).

Description.—Plant winter habit, midseason, midtall; stem white, strong; spike awnless, linear-oblong, middense, inclined; glumes glabrous, light brown, midlong, wide; shoulders wide, oblique to square; beaks midwide, obtuse, 0.5 mm. long; apical awns few, 3 to 20 mm. long; kernels white, short to midlong, soft, ovate to oval; germ midsized to large; crease midwide to wide, middeep; cheeks usually angular; brush midsized, midlong.

Dawson differs from Goldcoin chiefly in having white straw, an oblong spike, and no collar around the brush. Spikes, glumes, and kernels of Dawson wheat are shown in Plate XXIII, A.

History.—Originated in 1881 by Robert Dawson, of Paris, Ontario, Canada (*177*, p. 8). It was selected " in a field of Seneca or Clawson, in which he found one plant quite distinct and much superior to the rest of the crop. Mr. Dawson sowed the grain from this plant and has continued to grow this wheat since. It was practically unknown over Ontario until tested at the experimental station along with many old and new varieties and the comparative results published. It has ranked first in yield from the beginning " (*178*, p. 11).

Distribution.—Grown in Illinois, Indiana, Kentucky, Massachusetts, Michigan, Missouri, New York, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin. Figure 37 shows the distribution of this variety.

Synonyms.—Golden Bronze, Golden Chaff, Improved Amber, White Winter. Golden Bronze is the name under which a strain of this variety was being grown at the Cornell University Agricultural Experiment Station.

Golden Chaff is simply a shortening of the name Dawson Golden Chaff. Improved Amber is the name under which a sample of Dawson was obtained from the Wisconsin station. White Winter is a local descriptive name used for the variety by farmers.

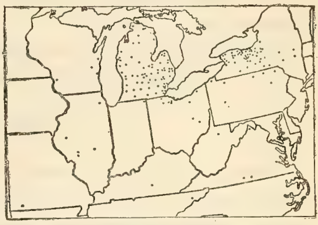


FIG. 37.—Outline map of the north-central United States, showing the distribution of Dawson wheat in 1919. Estimated area, 125,500 acres.

HONOR.

Description.—Honor apparently is identical with Dawson in all morphological characters, except for a slightly stronger stem. It is more winter resistant and a better yielder.

History.—Honor was originated by the plant-breeding department of the Cornell University Agricultural Experiment Station, in cooperation with the Office of Cereal Investigations, United States Department of Agriculture. During the experimental stages it was known as Cornell Selection 522–68. Concerning the variety, Dr. H. H. Love, who is in charge of the cooperative experiments at Cornell has written[12] as follows:

> Honor was selected from Dawson's Golden Chaff and seems to be a typical Golden Chaff. I think it is slightly more winter hardy than the commercial variety and has somewhat stiffer straw.

Distribution.—The selection was distributed from Cornell University to selected farmers for several years previous to the fall of 1920, when it was first offered for sale as Honor wheat by C. A. Rogers (*160*), of Bergen, N. Y.

SCHONACHER.

Description.—Plant winter habit, midseason, midtall; stem white, strong; spike awnless, oblong, middense, inclined to nodding; glumes glabrous, brown, midlong, midwide; shoulders midwide, oblique to square; beaks wide, obtuse, 0.5 mm. long; apical awns several, 2 to 30 mm. long; kernels white, midlong, semihard, ovate; germ midsized to large; crease midwide, middeep; cheeks angular; brush midsized, midlong.

Schonacher has a harder kernel than Dawson, and the spike is more nodding.

History.—The origin of this variety is undetermined. The variety was obtained from the Cornell University Agricultural Experiment Station, Ithaca, N. Y., in 1917.

Distribution.—Grown by the Cornell University Station. A red-kerneled wheat was reported under this name from Juniata County, Pa.

ARCADIAN (EARLY ARCADIAN).

Description.—Plant winter habit, midseason, short; stem white, strong, stout; spike awnless, clavate, short, dense, erect; glumes glabrous, brown, midlong, wide; shoulders midwide, oblique to rounded; beaks wide, obtuse, 1 mm. long; apical awns several, 3 to 10 mm. long; kernels white, usually short, usually soft, broadly ovate; germ midsized; crease wide, shallow to middeep; cheeks usually angular; brush small, midlong.

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[12] Correspondence of the Office of Cereal Investigations, dated Mar. 19, 1921.

The distinctive characters of the Arcadian variety are the stiff straw and the extremely clavate spike. A spike of this variety is shown in Plate V, Figure 6.

History.—Originated by A. N. Jones, Newark, Wayne County, N. Y., in 1895, as the result of a direct cross between Early Genesee Giant and Early Red Clawson (*61*, p. 221).

Distribution.—Grown commercially in Yakima and Klickitat Counties, Wash., in 1916. Not reported from New York, where it was first distributed.

WINDSOR (EXTRA EARLY WINDSOR).

Description.—Plant winter habit, early to midseason, short to midtall; stem purple, midstrong; spike awnless, fusiform, middense, nodding; glumes glabrous, brown, midlong, midwide; shoulders wanting to narrow, rounded to oblique; beaks narrow, obtuse, 0. 5 mm. long; apical awns few, 5 to 10 mm. long; kernels white, midlong, soft, broadly ovate; germ midsized to large; crease midwide, shallow to middeep; cheeks usually angular; brush small, midlong.

Windsor differs from Goldcoin chiefly in having an oblong, nodding spike.

History.—The origin is undertermined. It was grown by the Ohio Agricultural Experiment Station as early as 1892 (*204*, p. 52).

Distribution.—Grown experimentally by the Ohio and Cornell University (New York) Agricultural Experiment Stations and commercially in Kalamazoo County, Michigan.

GOLDCOIN (GOLD COIN).

Description.—Plant winter habit, early to midseason, short to midtall; stem purple, strong; spike awnless, clavate, middense, erect to inclined; glumes glabrous, brown, long, midwide; shoulders midwide, oblique to square; beaks wide, obtuse, 1 mm. long; apical awns several, 5 to 15 mm. long; kernels white, short to midlong, soft, ovate; germ midsized; crease midwide, middeep; cheeks usually rounded; brush small, midlong, collared.

The distinctive characters of Goldcoin wheat are the purple straw, clavate spike, and collared brush. Spikes, glumes, and kernels of this variety are shown in Plate XXIII, *B*.

History.—The Goldcoin variety is probably a descendant from the Redchaff or Redchaff Bald wheat mentioned in early agricultural literature as being grown in the Genesee Valley of New York, as early as 1798. The following history of Redchaff was recorded by Allen (*36*, p. 153) in 1885.

> The old Genesee Redchaff is a bald, white wheat, first cultivated in the same region in 1798, and for a long time it was the decided favorite. Since 1820, however, it has been very subject to rust and blast, but when circumstances are favorable it is still found to be highly productive. Its transfer to other localities may therefore be attended with great success.

Soules is an early name applied to a wheat apparently identical with Goldcoin. The following statement concerning the origin of Soules was recorded by Harmon (*103*, p. 225) in 1843:

> In the first volume of the New Genesee Farmer (*2*) this new wheat was noticed as being discovered, or a few heads being found, in a field of White Flint by Jonathan Soule, of Perrington, Monroe County.

This wheat became well established in New York in the late forties, and by 1857, according to Klippart, (*131*, p. 755–756), was an important variety in Ohio. About 1897 this wheat or a selection from it became known as New Soules. Soules and White Soules were reported in 1919 from Michigan.

Clawson, or White Clawson, has been found to be identical with Goldcoin, but the name, also, has a much earlier origin. According to Carleton (*58*, p. 65), the history of this wheat is as follows:

> This variety originated in Seneca County, N. Y., in 1865, through the selection of certain superior heads from a field of Fultz by Garrett Clawson. On planting the grain from these heads, both a white and red grained sort resulted the following season. The white wheat was considered the best, and the pint of seed obtained of this sort was sown, producing 39 pounds the following season. The third year after this 254 bushels were harvested and that season the variety was distributed to other farmers. In 1871 this variety took first premium at the Seneca County fair, and in 1874 seed was distributed by this Department. Though judged inferior by millers at times, this variety has become a very popular one. It must not be confused with Early Red Clawson, a very distinct variety.

The Goldcoin variety itself, is reported by Carleton (*58*, p. 66) to have been produced by Ira M. Green, at Avon, N. Y., about 1890, in the following manner:

> Mr. Green grew a field of Diehl Mediterranean, a bearded, red-grained wheat, and while passing through the field one day found a bald head possessing white grains. Planting every grain of this head, he found as a result next season that he had heads with very long beards, some with short beards, and others with none at all. The grain also was mixed, some red and some white. He desired the bald wheat—hence only the grains from the bald heads were again planted. From this as a beginning, a practically new variety resulted. Various names have been given to it by different seedsmen, but it is best known by the name Gold Coin.

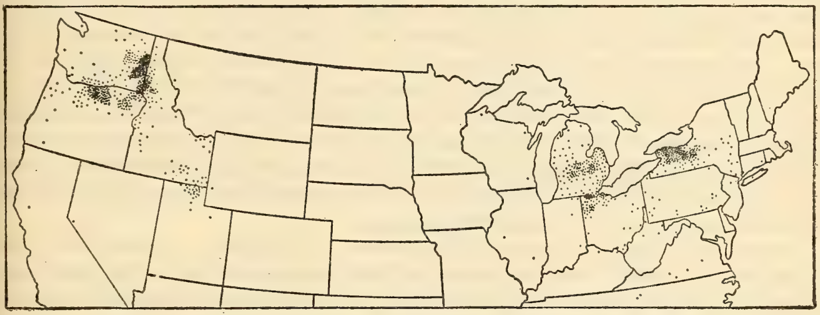

FIG. 38.—Outline map of the northern United States, showing the distribution of Goldcoin (Fortyfold) wheat in 1919. Estimated area, 947,000 acres.

The commercial production of Goldcoin wheat dates from about 1900.

Distribution.—Grown in California, Colorado, Connecticut, Idaho, Illinois, Indiana, Kentucky, Michigan, Montana, Nevada, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Utah, Virginia, Washington, West Virginia, Wisconsin, and Wyoming. This distribution is shown in Figure 38.

Synonyms.—Abundance, American Banner, Clawson, Eldorado, Fortyfold, Golden Chaff, Gold Bullion, Gold Medal, Goldmine, Improved No. 6, International No. 6, Junior No. 6, Klondike, New American Banner, New Soules, Niagara, Number 6, Oregon Goldmine, Plymouth Rock, Prizetaker, Prizewinner, Rochester No. 6, Soules, Superlative, Twentieth Century, White Century, White Clawson, White Eldorado, White Rock, White Russian, White Soules, White Surprise, and Winter King.

Eldorado, Golden Chaff, Gold Bullion, Gold Medal, Niagara, Goldmine, Oregon Goldmine, Plymouth Rock, Prize Winner, Superlative, Twentieth Century, White Century, White Eldorado, White Russian, and White Surprise are local names for the variety, used chiefly by growers in Michigan.

Abundance is a variety apparently identical with Goldcoin, which was introduced by L. P. Gunson & Co., of Rochester, N. Y., about 1894. Mr. Gunson has stated[13] "that this variety came from a new stooling wheat which we purchased from A. N. Jones. One of these crossbred varieties, of which we purchased a small amount, showed two different colors of chaff, and two were separated by hand selection. The Abundance was obtained from one of these selections." It probably was selected from the wheat Mr. Jones called Early White Leader. Abundance was reported in 1919 from Michigan, Tennessee, and West Virginia.

American Banner and New American Banner are names under which the variety is best known in Canada.

Clawson, or White Clawson, is identical with Goldcoin, but as previously indicated, has an earlier history. Clawson or White Clawson was reported in 1919 from Connecticut, Colorado, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Washington, and West Virginia.

Fortyfold is the name under which Goldcoin was distributed by Peter Henderson & Co., (*110*), seedsmen, of New York City, as early as 1899. The variety is grown under this name chiefly in California, Oregon, Washington, Idaho, and Utah.

Klondike is the name under which the same wheat was distributed by J. M. Thorburn & Co. (*191*), New York City, in 1908. It is grown in New York under this name. No. 6 was applied to this wheat by Hickox-Rumsey Seed Co., Batavia, N. Y. It is claimed by Mr. Rumsey that the name No. 6 antedates Goldcoin. International No. 6, Rochester No. 6, and possibly Improved No. 6, are names under which the variety was distributed by the International Seed Co., of Rochester, N. Y. The distribution of the variety under these names seems to date from about 1908. The Junior No. 6 is said to be an improved strain of No. 6, but is identical with Goldcoin. It was named and distributed by the Hickox-Rumsey Seed Co., Batavia, N. Y. Goldcoin is mostly grown in New York under the names given in this paragraph.

Prizetaker is the name used for the variety by the John A. Salzer Seed Co. (*163*), of La Crosse, Wis., as early as 1897, and possibly prior to that time. Prizetaker was reported from Illinois and Pennsylvania, but that grown in Illinois under this name is the variety known as Harvest Queen. Winter King is a name used for Goldcoin in Clearfield County, Pa.

JOHN BROWN.

Description.—Plant spring habit, early, tall; stem white, strong; spike awnless, fusiform to linear-oblong, middense, erect; glumes glabrous, brown, midlong, midwide; shoulders midwide, oblique to square; beaks narrow, acute, 1 mm. long; apical awns few, 3 to 15 mm. long; kernels white, midsized, soft, usually ovate; sometimes oval or elliptical; germ midsized; crease narrow to midwide, deep; cheeks rounded; brush midsized, midlong to long.

History.—The variety is of Australian origin, being one of the many crossbred wheats produced by William Farrer.

John Brown is the result of a rather complicated cross and has the following pedigree:

Blé carré × Wards White.
Improved Fife × Unnamed.
Hornblende × Unnamed.
Unnamed × Lambrigg Australian Talavera.
John Brown.

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[13] Reisner, John H. Wheat in New York. 1915. Unpublished thesis, Cornell University.

The cross was made in 1896 and named in 1901 (*188*, p. 282–283).

The first introduction of the variety into the United States is believed to have been in the fall of 1909, when F. D. Farrell, superintendent of the Nephi substation, Nephi, Utah, obtained a small quantity of the seed from the Department of Agriculture of New South Wales, Australia. Later introductions have been made by the United States Department of Agriculture (*197*, S. P. I. No. 36582) and also by the Wyoming Agricultural Experiment Station, which has distributed the variety in that State (*151*, p. 10).

Distribution.—Grown by the California and Wyoming stations and commercially in Wyoming.

ALLEN (RED ALLEN).

Description.—Plant spring habit, late, tall; stem white, midstrong; spike awnless, linear-fusiform, lax, inclined, glumes glabrous, brown, long, narrow; shoulders wanting to narrow, oblique; beaks narrow, acute, 1 mm. long; apical awns several, 5 to 20 mm. long; kernels white, midlong, semihard, ovate; germ usually small; crease wide, shallow; cheeks usually angular; brush small, midlong.

This variety is distinct because of its long lax spike. Spikes, glumes, and kernels are shown in Plate XXIV, *A*.

History.—The origin of Red Allen is undetermined. It has been grown in Washington for about 20 years.

Distribution.—Grown as Red Allen in Chelan, Douglas, Grant, and Okanogan Counties, Wash., and as Wolf Hybrid in Latah County, Idaho.

Synonym.—Wolf Hybrid. This variety has been commercially grown since about 1905. According to Hunter (*124*, p. 22) it was quite widely grown in Idaho in 1907, but since then it has largely disappeared from cultivation.

FEDERATION.

Description.—Plant spring habit, early, short; stem white, strong; spike awnless, oblong, dense, erect; glumes glabrous, brown, short, wide; shoulders wide, oblique to square; beaks narrow, acute, 0.5 mm. long; apical awns almost wanting; kernels white, usually short, soft, broadly ovate; germ midsized; crease usually narrow, shallow; cheeks rounded; brush midsized, midlong. Spikes, glumes, and kernels of this variety are shown in Plate XXV, *A*.

History.—According to Richardson (*158*, pp. 124–126)—

> It was produced by the late Mr. Farrer, wheat experimentalist, of New South Wales (Australia), from a cross between Purplestraw and Yandilla. Yandilla is a cross between Improved Fife and Etewah, an Indian variety. The production of this wheat was probably the greatest of Mr. Farrer's many triumphs in wheat breeding, for none of his many successful crossbred wheats have enjoyed such a wide measure of popularity as Federation.

Federation was first introduced into the United States by the United States Department of Agriculture (*197*, S. P. I. No. 38347) in 1914 from seed furnished by E. A. Cook, of Perth, West Australia. The variety first showed promise in nursery experiments at the Sherman County branch station, Moro, Oreg., in 1916, and was increased and thoroughly tested (*67*, p. 10). The first distribution to farmers for commercial growing was in the spring of 1920.

Distribution.—Grown by several experiment stations in the western part of the United States and commercially to a small extent in Oregon in 1920.

FOISY.

Description.—Plant spring habit, late, tall; stem white, strong; spike awnless, linear-clavate, middense to lax, erect; glumes glabrous, brown, midlong, midwide; shoulders narrow, rounded to oblique; keel incurved above; beaks wide, truncate, 1 mm. long; apical awns few, 3 to 15 mm. long; kernels white, short, soft, ovate; germ midsized; crease midwide, shallow to middeep; cheeks usually rounded; brush midsized, midlong.

Foisy wheat is easily distinguished by the tall plant and the long, rather lax, but clavate spike. Plate XXIV, *B*, shows spikes, glumes, and kernels of Foisy wheat.

History.—This variety originated on the farm of M. G. Foisy, near the site of West Woodburn, in northern Marion County, Oreg. About 1865, Mr. Foisy "noticed a head of red chaff wheat in his field of white chaff wheat, of unusual size, gathered it, and planted it in his garden until he had sufficient to seed a small field. Mr. Foisy, who was a Frenchman, was too modest to call it after his name, but insisted that it was Oregon Red Chaff, yet there is no one about him that knows it by any other name than Foisy" (*100*, p. 10).

Distribution.—Grown in 11 counties of western Oregon.

Synonym.—Oregon Golden Chaff, Oregon Red Chaff, and Red Chaff. These are all local names used for the variety in Oregon.

HARD FEDERATION.

Description.—Plant spring habit, early, short; stem white, strong; spike awnless, oblong, dense, erect; glumes glabrous, brown, short, wide; shoulders wide, square; beaks narrow, acute, 0.5 mm. long; apical awns wanting; kernels white, short, hard, ovate, with truncate tip; germ large; crease midwide, middeep, frequently pitted; cheeks angular to rounded; brush large, midlong.

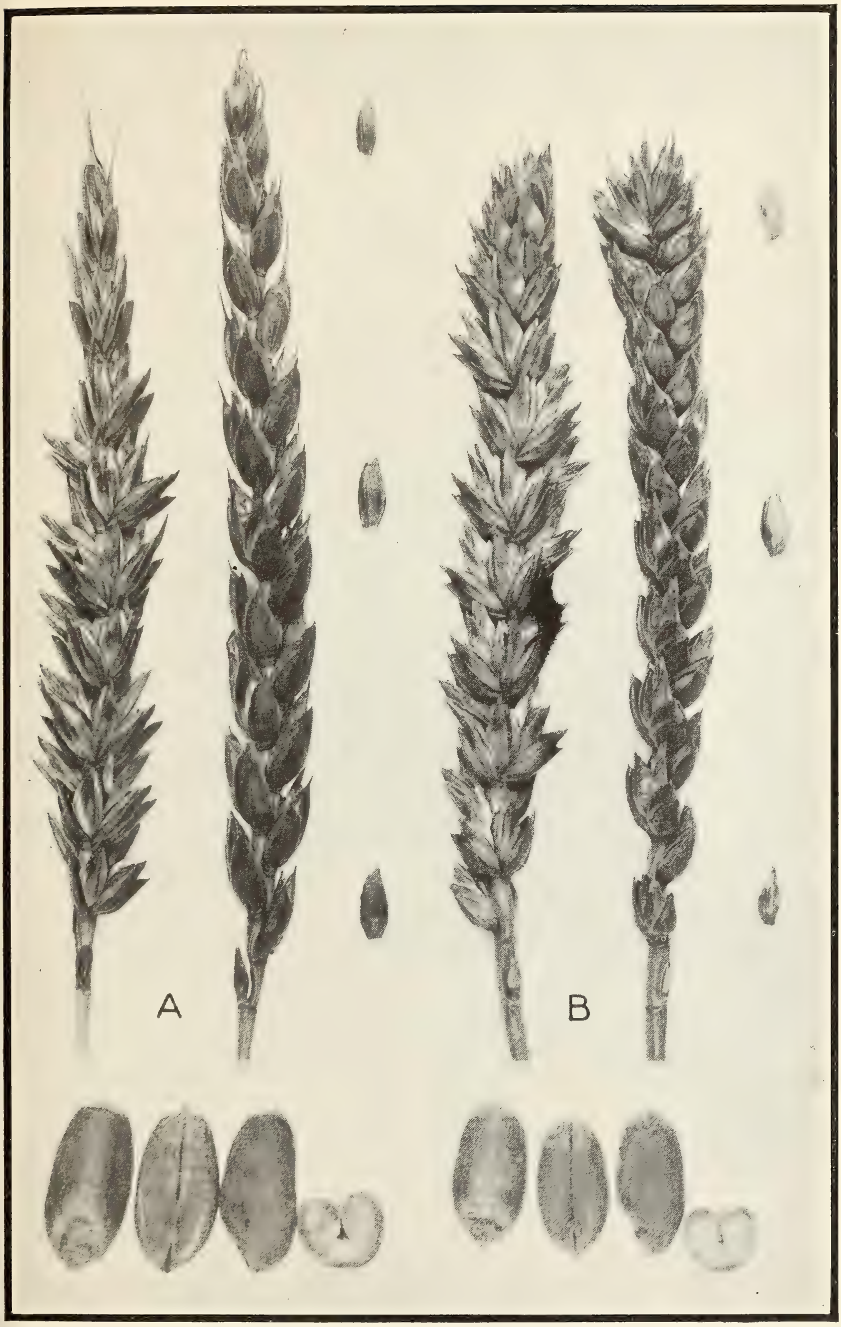
Hard Federation differs from Federation in being slightly shorter and in having a hard kernel. Spikes, glumes, and kernels of Hard Federation are shown in Plate XXV, *B*.

History.—Hard Federation was originated by selection from the Federation in Australia. The following history was recorded (*30*, p. 664) in 1914:

> In consequence of the variations of the ordinary type exhibited by the strain of Federation wheat now being grown at Cowra Experiment Farm, it has been deemed advisable to apply a distinct name to it, and "Hard Federation" has been selected as the most appropriate. The departure from type was first noticed by J. T. Pridham, plant breeder, in 1907 or 1908, one of the plants selected from the stud plats being observed to thrash grain of remarkably hard and flinty appearance. The plant has the distinctive brown head and general appearance of Federation in the field, but the grain was of a class that has never been seen in the variety before. The seed was propagated, and in 1910 the occurrence of white heads was noticed, and from then until 1912 distinctly white heads were common among the brown, but in 1913 there were no white-eared plants, and it is hoped that the seed will now be true to type.

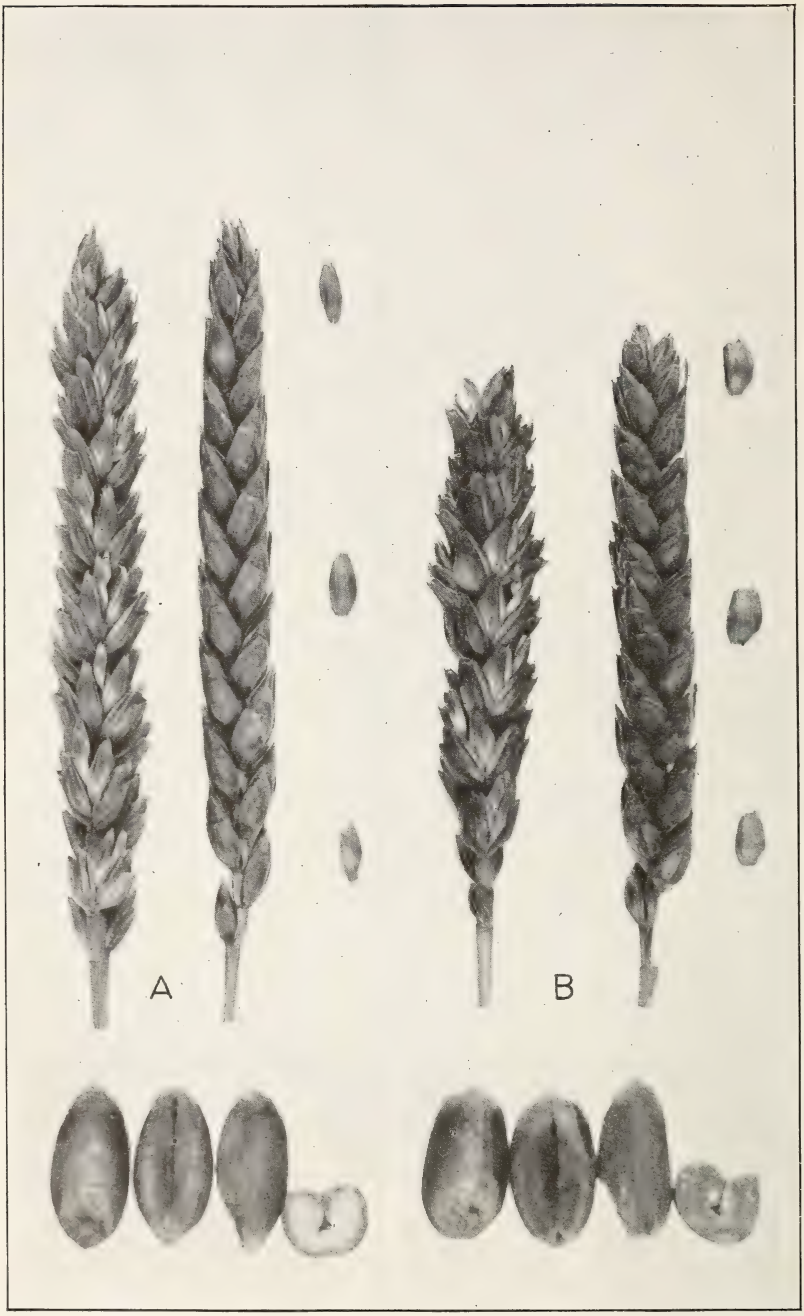
Hard Federation was first introduced into the United States in August, 1915, by the United States Department of Agriculture (*197*, S. P. I. No. 41079). The seed was presented to the United States Department of Agriculture by George Valder, undersecretary and director of the Department of Agriculture, Sydney, New South Wales. It was first grown at the Sherman County Branch Station, Moro, Oreg., in 1916. Experiments conducted by the Department in Oregon and California from 1917 to 1919, reported by Clark, Stephens, and Florell (*67*, p. 12–17), have shown it to be a high-yielding, dry-land wheat, and it has since been increased and distributed.

Distribution.—Grown at several experiment stations in the western part of the United States and commercially to a slight extent in California and Oregon in 1920.



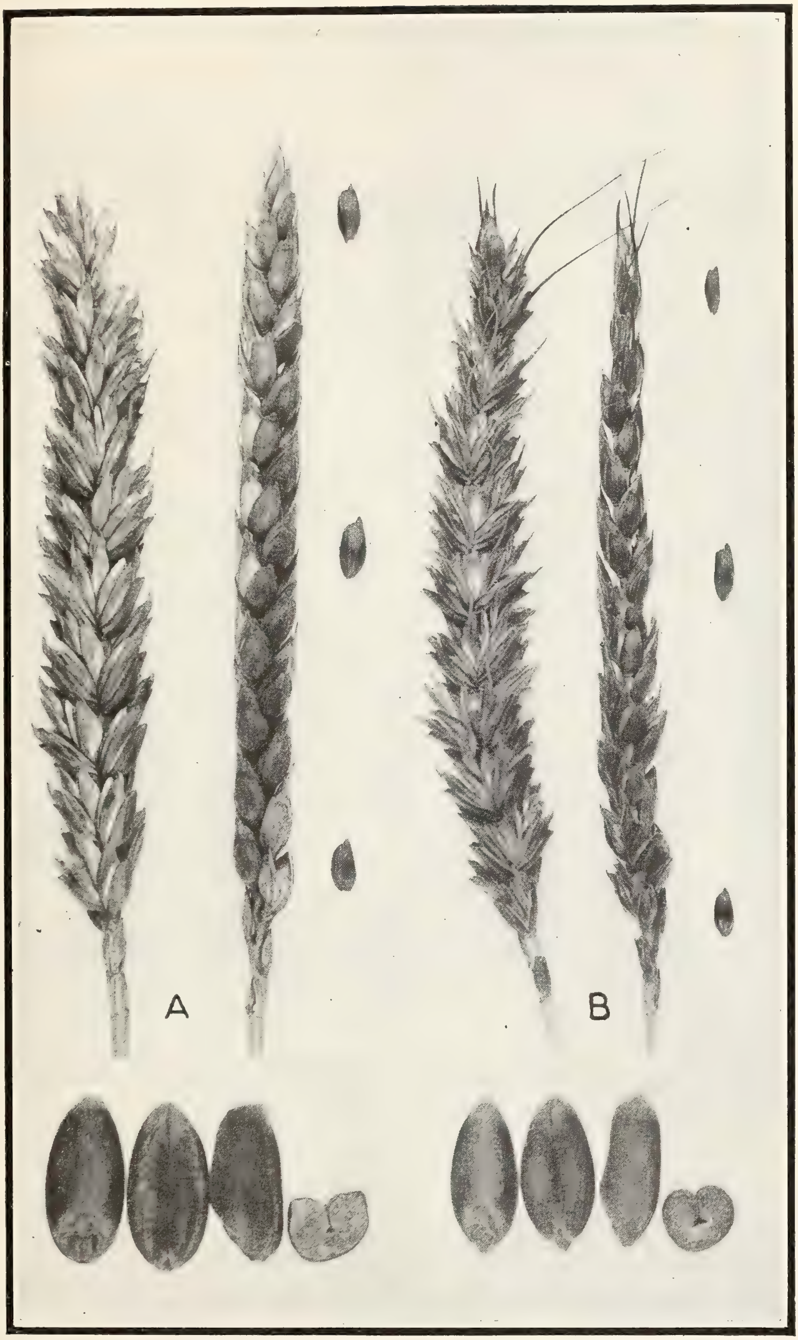
ALLEN (A). FOISY (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



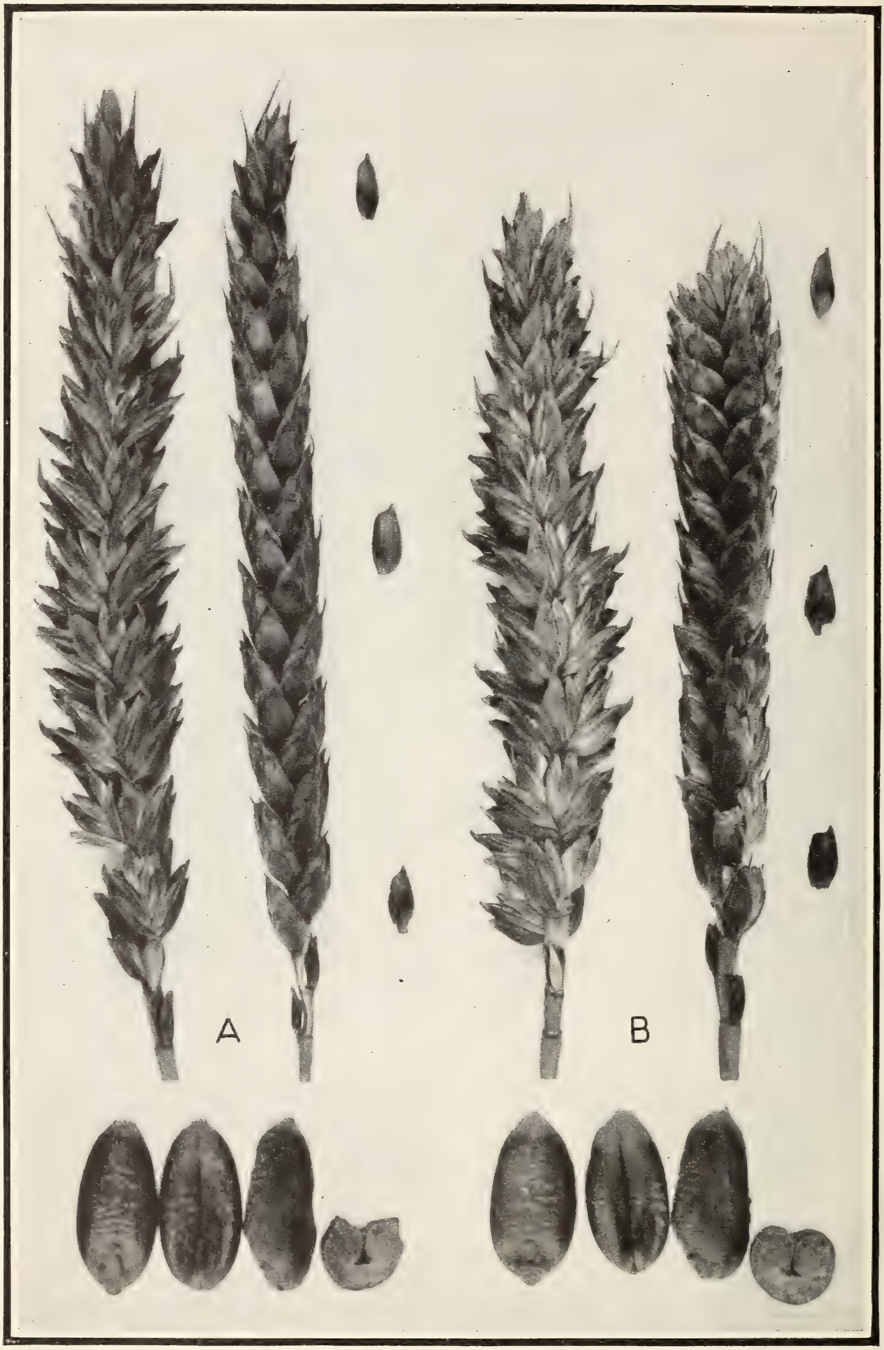
FEDERATION (A). HARD FEDERATION (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



RED WAVE (A). ODESSA (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



RUPERT (A). RURAL NEW YORKER NO. 6 (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

GOLD DROP.

Description.—Plant winter habit, early, midtall; stem white, weak to midstrong; spike awnless, short, fusiform, middense, erect to inclined; glumes glabrous, brown, short to midlong, midwide to wide; shoulders wide, oblique to square; beaks wide, obtuse, 0.5 mm. long; apical awns few, 2 to 10 mm. long; kernels red, short to midlong, soft, ovate; germ midsized; crease midwide, middeep; cheeks rounded; brush small, midlong.

Gold Drop is distinguished from other wheats of this group by its earliness and by the short, fusiform spike.

History.—This doubtless is the old English variety usually referred to as Golden Drop. Koernicke and Werner (*133*, p. 295) state that this variety was bred in 1834 by a Mr. Gorrie, at Annat Garden in Great Britain. It has been grown in the United States for many years, being mentioned by Rawson Harmon, of Wheatland, Monroe County, N. Y., in 1843 (*103*, p. 228). The samples furnishing the plants here described were obtained from Izard County, Ark., where farmers state that it has been grown for at least 25 years.

An improved strain of Golden Drop, called Hallet's Pedigree Golden Drop, was used by Cyrus G. Pringle as one of the parents of Defiance.

Distribution.—Grown as Gold Drop in Arkansas, Missouri, and Pennsylvania, and as Littleton in Humphreys County, Tenn. A bearded spring wheat called Gold Drop was reported in Iowa.

Synonyms.—Golden Drop, Littleton.

HOMER.

Description.—Plant winter habit, midseason, midtall to tall; stem white, midstrong; spike awnless, oblong-fusiform, middense, erect to inclined; glumes glabrous, brown, midlong, midwide; shoulders midwide, oblique to elevated; beaks wide, obtuse, 0.5 to 1.0 mm. long; apical awns few, 2 to 10 mm. long; kernels red, midlong, soft, ovate; germs midsized to large; crease wide, middeep; cheeks angular; brush small to midsized, midlong, sometimes collared.

Homer differs from Red Wave in having an inclined instead of a nodding spike.

History.—The origin of this variety is undetermined. The plants described were grown from seed obtained from Chatham County, N. C., in 1919, where it had been grown for the past 10 years.

Distribution.—Grown in Chatham County, N. C.

RED WAVE.

Description.—Plant winter habit, midseason to late; midtall to tall; stem white, midstrong; spike broadly fusiform, middense, nodding; glumes glabrous, brown, midlong, wide; shoulders wide, rounded to oblique, sometimes nearly square; beaks wide, obtuse, 1 mm. long; apical awns several, 5 to 15 mm. long; kernels red, midlong, soft, ovate; germ midsized; crease midwide to wide, middeep, sometimes pitted; cheeks usually angular; brush midsized, midlong.

Red Wave is distinguished by the broadly fusiform, nodding spike. It is inferior to many other soft red winter wheats for milling and bread making. Spikes, glumes, and kernels of this variety are shown in Plate XXVI, *A*.

History.—Originated by A. N. Jones, Le Roy, Genesee County, N. Y., in 1906, as the result of a cross between Early Red Clawson and an unnamed crossbred wheat of Russian parentage (*110*, 1908).

Distribution.—Grown in Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Missouri, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin. This distribution is shown in Figure 39.

Synonyms.—Advance, Indiana Red Wave, Jones Red Wave, Old Dutch, Red Chaff, Red Ivory, Red Wafer, Ruble, Rust Proof, Waif, Waverly, and Worlds Fair.

Old Dutch, Red Chaff, Red Ivory, Red Wafer, Waif, Waverly, and Worlds Fair are local names used by growers, chiefly in Indiana. Advance is a name under which this wheat was distributed by the John A. Salzer Seed Co., of La Crosse, Wis. Indiana Red Wave is the name used for the variety by growers in States adjoining Indiana who obtained their seed from that State, as Red Wave is a rather widely grown variety in Indiana.

Jones Red Wave is a name used because the variety was originated by A. N. Jones, as stated above. Ruble is a variety similar to Red Wave, except for having a denser and less nodding spike. It was obtained from H. W. Anderson, Washington College, Tenn., who states that it has been grown in Washington County, Tenn., for the past 20 years. Rust Proof is the name under which a sample of Red Wave was obtained from Osceola County, Mich.

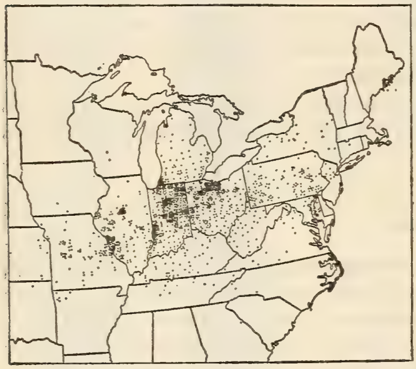


FIG. 39.—Outline map of a portion of the northeastern United States, showing the distribution of Red Wave wheat in 1919. Estimated area, 1,132,400 acres.

FLEMING.

Description. — This variety differs from Red Wave only in being slightly later and in having a somewhat narrower and less nodding spike.

History. — Fleming was imported from Russia. According to officials of the Montana Agricultural Experiment Station, in correspondence with the Office of Cereal Investigations, "Mr. E. E. Fleming obtained it from a friend from Russia, since dead, and named it 'Russian Club.'" Several hundred acres now are grown about Forsyth, Mont.

Distribution.—Grown by the Montana Agricultural Experiment Station as Fleming and commercially in Rosebud County, Mont., as Russian Club.

Synonyms.—Russian Club, Winter Club. These names are both used by growers in Rosebud County.

PETERSON (LARS PETERSON).

Description.—Plant winter habit, midseason, tall; stem white, midstrong; spike awnless, broadly fusiform, long, middense, nodding; glumes glabrous, brown, midlong, midwide to wide; shoulders midwide, oblique to rounded; beaks wide, obtuse, 1 mm. long; apical awns few, 2 to 5 mm. long; kernels red, midlong, soft, broadly ovate; germ midsized; crease wide, middeep to deep, sometimes pitted; cheeks usually angular; brush midsized, midlong.

Peterson differs from Red Wave in being slightly taller and in having a longer spike and narrower glumes and shoulders.

History.—The history of Peterson wheat is undetermined. The following statements relate to its culture in Arizona:

A wheat known locally as Lars Peterson grows fairly well in high altitudes under dry-farming conditions. County agents think it fairly promising for dry-land cultivation.[14]

Peterson wheat has been planted in this section of the country for the past 25 years, but of late Bluestem spring wheat has been planted more extensively.[15]

Distribution.—Grown in Navajo County, Ariz.

ODESSA.

Description.—Plant winter habit, late, midtall to tall; stem usually white, midstrong; spike awnless, fusiform, middense to lax, inclined; glumes glabrous, brown, long, midwide, shoulders midwide, usually oblique to square, sometimes elevated; beaks usually wide, obtuse, 1 mm. long; apical awns several, those below apex strongly incurved or recurved, 5 to 20 mm. long; kernels red, midlong, soft, ovate to elliptical; germ small; crease midwide, middeep; cheeks usually rounded; brush small, midlong to long.

Odessa is very winter hardy. It is distinguished from other varieties in this group by its late maturity and its slender fusiform spike. Different strains of Odessa vary widely, due in part to natural field hybridization. Several white-kerneled strains have been selected from these natural hybrids, one of which appears to be immune to bunt. Because of its winter resistance, it often is used as one parent for crosses in breeding for greater winter resistance. Minhardi and Minturki, winter-hardy varieties developed at the Minnesota Agricultural Experiment Station, are the result of a cross between Odessa and Turkey. Spikes, glumes, and kernels of Odessa wheat are shown in Plate XXVI, *B*.

History.—According to Carleton (*58*, p. 53) Odessa is of Russian origin. Several introductions have been made. The variety was grown in Minnesota as early as 1865:

> The Odessa wheat is one of the importations of the United States Department of Agriculture that is coming into notice and favor. It was started, says the Lake City (Minn.) Leader, by Porter Martin, of Dakota County, four years ago, from a small package of seed sent him by Hon. Ignatius Donnelly and has been grown exclusively on his farm till this year, for the purpose of giving it a reliable test (*5*, p. 238).

The variety was included among a number of wheats obtained by the Minnesota Agricultural Experiment Station in 1893 and 1894 from American consuls and from seed dealers in Russia (*109*, p. 40). It is evident, however, that the variety was quite widely grown in the United States before that time. A variety known as Odessa was grown by the Wisconsin College of Agriculture in 1875 (*12*). A sample of Odessa wheat obtained from the Black Sea region was grown by the Colorado Agricultural Experiment Station in 1879 (*46*, p. 40). It also was reported to have been grown in Utah for 40 years, having been taken there from the Eastern States by Mormon settlers, and in California in the seventies and eighties, because of its resistance to rust in the coastal areas.

Distribution.—Grown in California, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Missouri, Nebraska, Tennessee, Utah, Wisconsin, and Wyoming. A map showing the distribution of Odessa wheat is presented as Figure 40.

Synonym.—Grass. This was reported as a synonym for Odessa by Tracy in 1880 (*195*, p. 396). A sample of Grass wheat nearly identical with Odessa was obtained from W. E. Bass, of Stevensville, Mont., in 1918, who states that it has been grown for five to eight years to a very limited extent, both as a winter and a spring wheat in Ravalli County, Mont. Carleton stated that Odessa could be grown as either a winter or a spring wheat. Most samples grown by the writers showed the winter habit, but as some strains are heterozygous for winter and spring habit a portion of the crop from the bulk variety would produce seed from spring sowing.

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[14] Letter of Prof. W. E. Bryan, University of Arizona, Tucson, Ariz., Mar. 31, 1917.

[15] Varietal Survey. Report of James L. Hall, Pinedale, Navajo County, Ariz., 1919.

RUDDY.

Description.—Plant winter habit, late, tall; stem glaucous, white, strong; spike awnless, oblong, middense, erect to inclined; glumes glabrous, light brown, short, wide; shoulders wide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns few, 2 to 8 mm. long; kernels red, midlong, soft, oval; germ midsized; crease midwide, middeep; cheeks angular; brush midsized, long.

This is a high-yielding variety, but its milling quality is poor.

History.—Ruddy was originated by hybridization at the Washington Agricultural Experiment Station, Pullman, Wash. It has Jones Fife, Little Club, and Turkey in its parentage and is a selection from the same cross from which Triplet was obtained. Ruddy was grown first as a pure line in 1910 and was named and distributed to a few farmers in the fall of 1919.

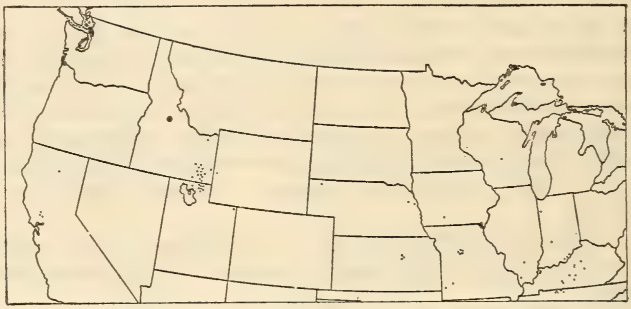


FIG. 40.—Outline map of the northwestern United States, showing the distribution of Odessa wheat in 1919. Estimated area, 54,200 acres.

Distribution.—Grown experimentally in Washington.

RUPERT (RUPERT'S GIANT).

Description.—Plant winter habit, midseason, midtall; stem white, midstrong; spike awnless, linear-obling to subclavate, middense, nodding; glumes glabrous, brown, midlong, wide; shoulders wanting to narrow to midwide, oblique; beaks wide, obtuse, 1.0 long; apical awns several, 2 to 20 mm. long; kernels red, midlong, soft, ovate to elliptical; germ small to midsized; crease wide, middeep to deep; cheeks usually rounded; brush midsized, midlong.

Rupert differs from Red Wave in having an oblong spike, which sometimes is subclavate. Spikes, glumes, and kernels of this wheat are shown in Plate XXVII, *A*.

History.—The origin of this variety is not definitely known. Apparently it was first grown under the name Woods, concerning which R. Crouch, of Morristown, Tenn., wrote the Office of Cereal Investigations, as follows:

> Mr. William Woods, of Talbott, Tenn., many years ago noticed an extra head of wheat in his field, and from this head of wheat Woods wheat is largely raised in this (Hamblen) and adjoining counties.

Another early name for the variety is Hartzel. John D. Daley, of Clinton, Ohio, in correspondence with the Office of Cereal Investigations, in 1919, states that this wheat "was selected out of some wheat grown by Joe Hartzel, of Barberton, Ohio, about 18 years ago."

A wheat under the name Rupert's Giant probably was first advertised by J. M. Thorburn & Co., seedsmen, of New York City (*191*), but this was described as "a red, bearded wheat, long stem, strong growing, resists the Hessian fly best." Rupert's Giant, grown by the writers from samples obtained from the Cornell University (N. Y.) Agricultural Experiment Station in 1913 and 1917, is awnless and is as described above.

Distribution.—Grown in Dickinson County, Kans., and under the synonyms in Kentucky, Michigan, Ohio, and Tennessee. The variety was grown in New York several years ago, but has now probably gone out of cultivation in that State.

Synonyms.—Gold Medal, Hartzel, Haskell, Red Hassel, Red Haskell, Ruck, and Woods.

Gold Medal is the name used for the variety grown in the vicinity of Morley, Mecosta County, Mich. Hartzel, Haskell, Red Hassel, and Red Haskell are names used by growers in Ohio. E. F. Cranz, of Ira, Ohio, wrote the Office of Cereal Investigations in 1919 concerning Red Haskell as follows:

> I think it is safe to say that one-half the acreage in Summit County this year is of that variety. It has been grown here about 8 or 10 years and became very popular soon after it was introduced.

Ruck is the name under which a sample of this variety was obtained at Dennis, Lawrence County, Ky. Woods, as indicated above, is the name under which the variety is grown in Blount County, Tenn.

RURAL NEW YORKER NO. 6.

Description.—Plant winter habit, early, short; stem white, stout, midstrong; spike awnless, clavate, dense, erect to inclined; glumes glabrous, brown, midlong, wide; shoulders midwide to wide, oblique to square; beaks wide, obtuse, 1 mm. long; apical awns few, 5 to 20 mm. long; kernels red, small to midlong, soft, ovate, and broad across basal end; germ midsized; crease midwide, middeep; cheeks rounded; brush midsized, midlong.

This variety is distinguished by its dense, clavate spike. Spikes, glumes, and kernels of this variety are shown in Plate XXVII, *B*.

History.—This variety is reported to have been originated by crossing wheat and rye. The cross was made by Elbert S. Carman, editor of the Rural New Yorker, in the season of 1883 (*23*). The Martin variety, known also as Armstrong and Landreth, was the mother parent of the cross. Seed of the variety was first offered for sale by Peter Henderson & Co. (*110*), seedsmen, of New York City, in 1894. Leighty (*139*, p. 426), in reviewing Mr. Carman's wheat-rye hybrids, gives the following conclusions regarding Rural New Yorker No. 6:

> From this description, and from a statement made elsewhere concerning its origin, it seems that No. 6 is actually descended from the true wheat-rye hybrid obtained in 1883. It is noteworthy for the fact, since it is the only variety introduced by Mr. Carman, whose record, so far as determined by the writer, clearly indicated such origin.

Distribution.—Possibly grown as No. 6 in Michigan, New York, and Ohio. Its distribution has become so confused with Goldcoin, which also is called No. 6, that no definite distribution can be given.

Synonyms.—Burtaker, No. 6, Red Hussar, and Twentieth Century. Burtaker is the name under which the variety has been grown in Cheboygan County, Mich., for the past 8 years. No. 6 is an abbreviation of the full name, and is the name used by most growers in New York. Red Hussar is a name under which this variety was obtained from the Cornell University Agricultural Experiment Station. The true Red Hussar, however, is an awned variety. Twentieth Century is the name used for the variety in Erie County, Ohio, where it has been grown for 15 years or more.

SQUAREHEADS MASTER.

Description.—Plant winter habit, late, midtall; stem white, strong, stout; spike awnless, clavate, dense, erect; glumes glabrous, brown, midlong, wide; shoulders wanting to narrow, oblique; beaks wide, obtuse, incurved, 1 mm. long; apical awns few, 1 to 10 mm. long; kernels red, midlong, soft, broadly ovate; germ small to midsized, abrupt; crease midwide, middeep; cheeks rounded; brush large, midlong. Differs from Red Russian only in having brown glumes.

History.—The variety described above is found rather commonly as a mixture in fields of the Red Russian variety in Idaho and Washington. Squareheads Master is an English variety, and the history of its introduction to the Pacific Northwest is not known. A sample introduced from England in 1911 by the United States Department of Agriculture is very similar to several selections the writers have made of the mixtures in Red Russian fields in Washington and also to a selection from a field of Red Russian made by Glen Roundtree, Boistfort, Lewis County, Wash., who increased it and now has a field of the variety. In England, Squareheads Master is reported to have been selected by Mr. Teverson from Scholey's Squarehead, and is probably the result of a natural cross between Scholey's and the Golden Drop (*85; 155*, p. 33).

Distribution.—Grown as a mixture in fields of other varieties in California, Idaho, and Washington, and in pure culture to a very limited extent in Lewis County, Wash.

Synonyms.—Australian Club, Brown Squarehead, Redchaff Red Russian. Australian Club is the name which was first used for the Brown Squarehead wheat by Mr. Roundtree. Brown Squarehead and Redchaff Red Russian have been used as names to describe the wheat where it occurs as mixtures, because it differs from the Squarehead and Red Russian varieties principally in glume color.

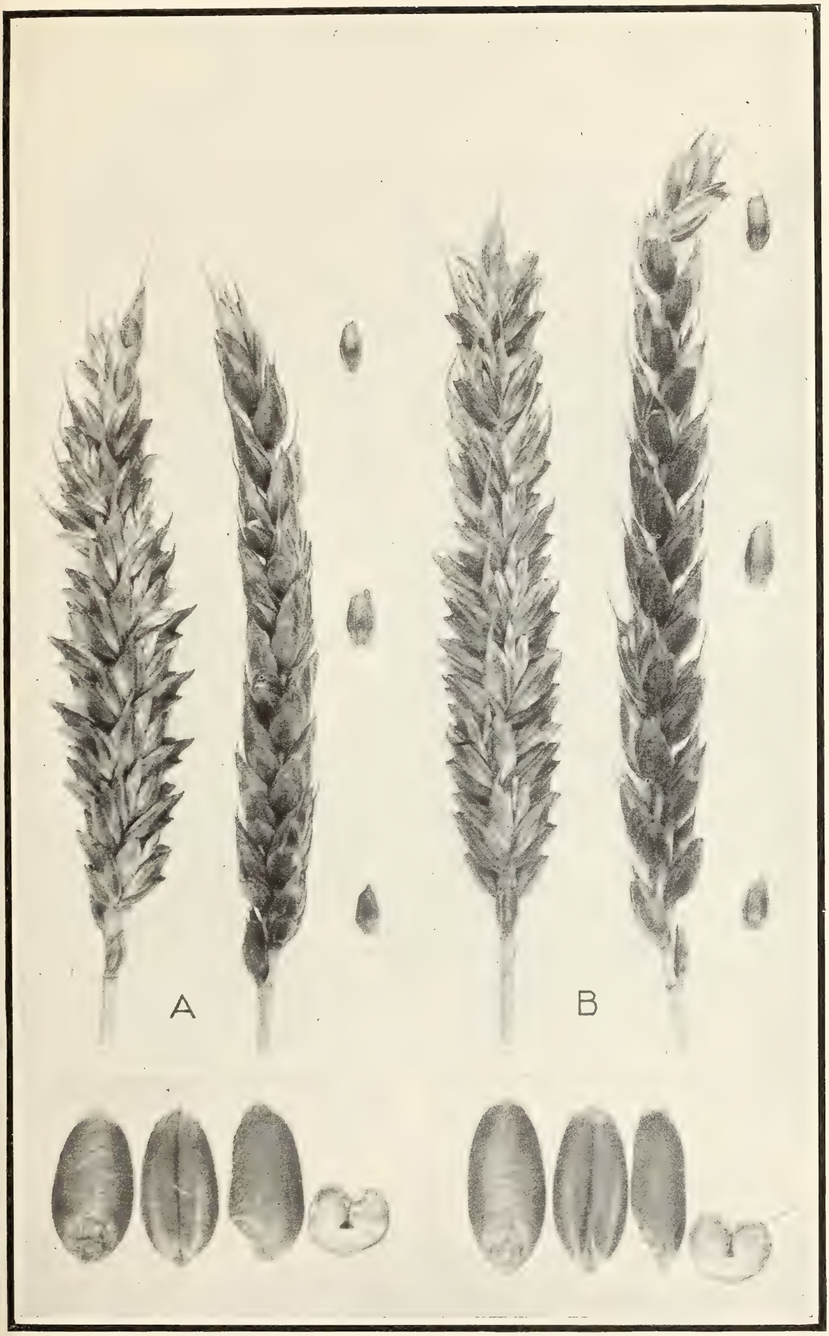
CURRELL (CURRELL'S PROLIFIC).

Description.—Plant winter habit, early, midtall; stem usually purple, midstrong; spike awnless, fusiform, middense, inclined; glumes glabrous, brown, midlong, narrow to midwide, shoulders midwide, oblique to square; beaks usually wide, sometimes nearly wanting, 0.5 mm. long; apical awns few, 3 to 10 mm. long; kernels dull red, short to midlong, soft, ovate; germ midsized; crease narrow to midwide, shallow to middeep, distinctly triangular; cheeks usually rounded; brush small, midlong.

Currell is distinguished from other varieties in this group of purple-strawed wheats by its slender spike. Spikes, glumes, and kernels of this variety are shown in Plate XXVIII, *A*.

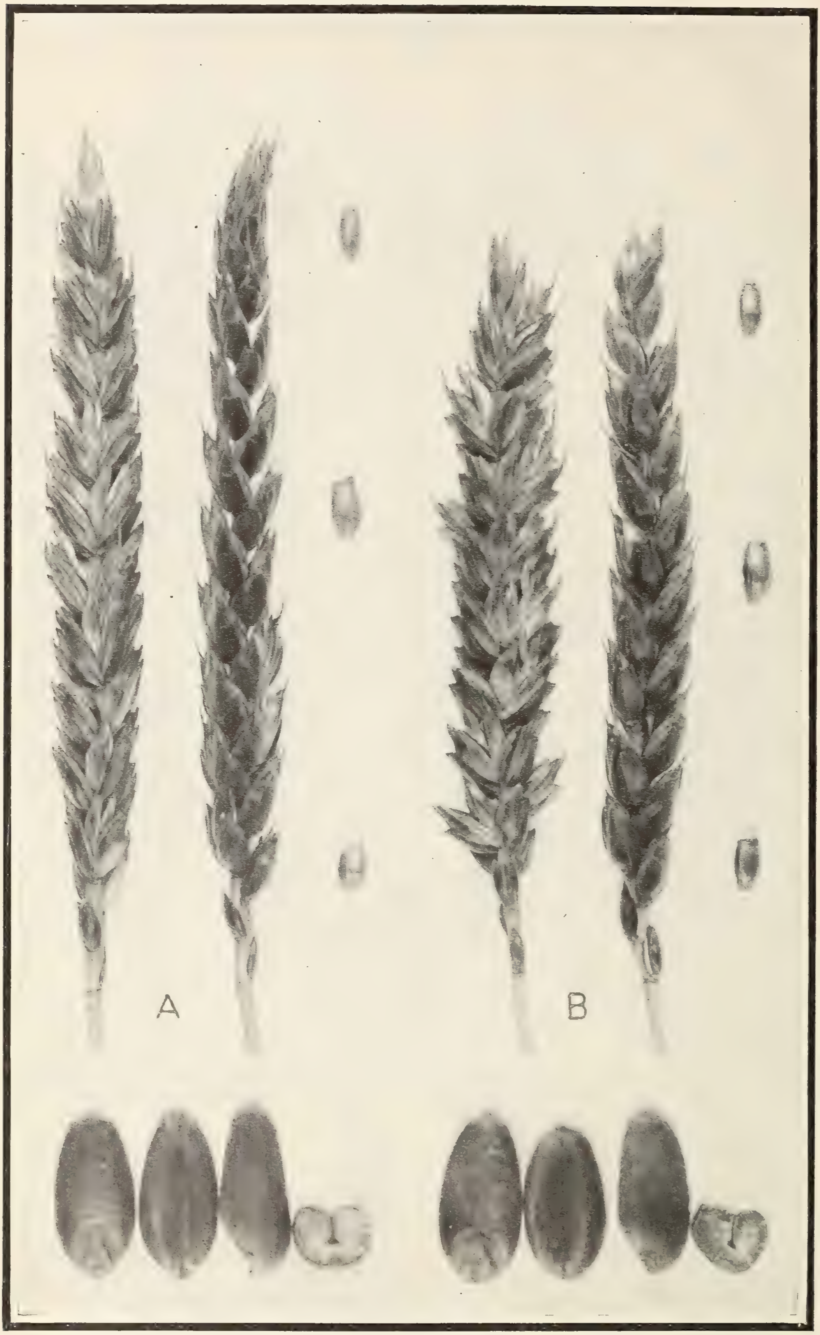
History.—The history of Currell (Currell's Prolific) has been recorded by Carleton (*61*, p. 202) as follows:

> Currell Prolific wheat was selected by Mr. W. E. Currell, of Virginia, from a field of Fultz in 1881. The original seed was from three spikes. It was first sold for seed in 1884.



CURRELL (A). POOLE (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



CHINA (A). RED MAY (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

Distribution.—Grown in Alabama, Arkansas, Delaware, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Missouri, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia. The distribution is shown in Figure 41.

Synonyms.—Gill, Golden Chaff, Pearl Prolific, Perfection, Prettybone, Prolific, Red Odessa, Red Prolific, and Tennessee Prolific.

Gill is a name used for Currell by growers in Kentucky. The name is also used for the Poole variety in the same State. Golden Chaff is practically the same if not entirely identical with Currell. The origin of this variety is not known. It has been grown by the Alabama Agricultural Experiment Station since 1902 (*83*, p. 106–111). T. W. Wood & Sons, seedsmen, of Richmond, Va., have advertised and distributed the variety in the Southeastern States since about 1905. It has been reported from nearly all the States in which Currell is grown.

Pearl Prolific is probably a mispronunciation of the name Currell Prolific. A sample of this variety obtained from the Cornell University station in 1912 proved to be identical with Currell. Pearl Prolific is grown in Alabama, Indiana, Kansas, Kentucky, Maryland, Missouri, Ohio, Tennessee, and Virginia. Perfection is apparently identical with Currell. It was grown by the Ohio Agricultural Experiment Station as early as 1895 (*204*, p. 39). Perfection is grown in Indiana, Missouri, Ohio, Pennsylvania, and Tennessee. Prettybone is the name of a wheat almost identical with Currell which was obtained in 1919 from Madison County, N. C., where it had been grown for at least four years.

Prolific is a shortening of the name of the variety as used by growers. Red Odessa is the name under which a sample of Currell was obtained from Smiths Grove, Ky., in 1919. Red Prolific is a name applied to Currell because of the color of the glumes. Tennessee Prolific is a name used for the variety in Alabama.

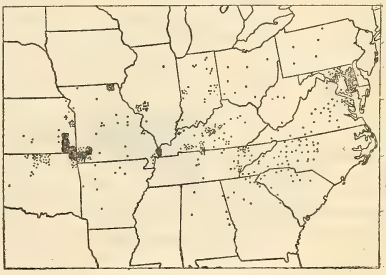


FIG. 41.—Outline map of the east-central United States, showing the distribution of Currell wheat in 1919. Estimated area, 645,000 acres.

WINTER CHIEF.

Description.—Plant winter habit, midseason, short; stem faintly purple, strong; spike awnless, broadly oblong, middense, erect to nodding; glumes glabrous, brown, long, midwide; shoulders midwide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns several, 3 to 20 mm. long; kernels red, midlong, soft, ovate to oval, frequently elliptical, flattened; germ small; crease midwide, middeep to deep; cheeks usually rounded; brush small to midsized, midlong.

Winter Chief differs from Poole principally in being shorter and having more erect spikes.

History.—The origin of Winter Chief is undetermined. A sample was obtained from the Indiana Agricultural Experiment Station in 1913, which in turn had received it from Everitt's O. K. Seed Store, Indianapolis, Ind.

Distribution.—Winter Chief is not known to be commercially grown.

POOLE.

Description.—Plant winter habit, midseason, midtall; stem purple, midstrong; spike awnless, usually fusiform, sometimes nearly oblong or linear-oblong, wide, middense to lax, usually nodding; glumes glabrous, brown, midlong, wide; shoulders wide, oblique to square; beaks wide, obtuse, 0.5 mm. long; apical awns several, 3 to 20 mm. long; kernels red, midlong, soft, ovate to oval, frequently elliptical, flattened; germ small to midsized; crease midwide, middeep to deep; cheeks usually rounded; brush small to midsized, midlong.

This variety is distinguished by the wide, nodding spikes. The kernels are rather narrow, flattened, and rounded in outline. Spikes, glumes, and kernels of Poole wheat are shown in Plate XXVIII, *B*, and a single spike in Plate V, Figure 4.

History.—The origin of the Poole variety is undetermined, but it has been an important variety in Ohio and Indiana for about 35 years. It was grown by the Ohio Agricultural Experiment Station as early as 1884 (*19*, p. 15).

Distribution.—Grown in Alabama, Delaware, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Missouri, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and West Virginia, and under names of synonyms in Arkansas and Oklahoma in addition. This distribution is shown in Figure 42.

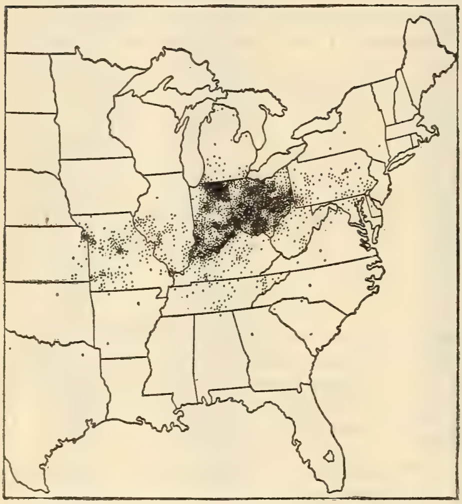


FIG. 42.—Outline map of the eastern United States, showing the distribution of Poole wheat in 1919. Estimated area, 2,453,400 acres.

Synonyms.—Beechwood or Beechwood Hybrid, Bluestem, California Red, Gill, Harvest King, Hedge Prolific, Hundred Mark, Hydro Prolific, Mortgage Lifter, Kentucky Bluestem, Nissley or Nissley's Hybrid, Ocean Wave, Oregon Red Chaff, Red or California, Red Amber, Red Chaff, Red Fultz, Red King, Red Russell, Royal Red Clawson, Sweet Water Valley, Wagner, and Winter King.

Beechwood (originally Beechwood Hybrid) was distributed by J. W. Stillwell, Troy, Ohio, about 1898. In a letter under date of July 15, 1898, to the Office of Cereal Investigations he has given the history as follows:

> Mixed one-half bushel Rudy, one-half bushel Red Fultz (not Mediterranean), one-half bushel Red Velvet Chaff together. The third year from mixture I named Beechwood Hybrid. Mixed because Rudy is soft straw and large grain, Velvet strong straw and small grain, Fultz was put in to get rid of beards.

A mixture of Poole and Red May is now most generally grown as Beechwood. It has largely disappeared from commercial culture.

Bluestem and Kentucky Bluestem are names used by growers for the Poole variety because of its purple straw. Kentucky Bluestem was reported from Arkansas, Georgia, Michigan, Missouri, South Carolina, and West Virginia.

California Red is a name occasionally used for the variety under the supposition that the seed came originally from California. A sample of Poole called Red or California was obtained in 1919 from Warren County, Tenn., where it had been grown for at least 30 years. Gill is a name used for Poole by many growers in Kentucky.

Harvest King was distributed by J. A. Everitt & Co., (*89*, p. 4–7) seedsmen, of Indianapolis, Ind., from 1894 to about 1900. There is no information regarding the origin of the variety, and it probably is only a lot of seed of the Poole variety renamed by the Everitt Seed Co., as such renaming was a common practice of that firm. As the wheat was widely advertised under this name, it is now grown nearly as widely under the name Harvest King as under the name Poole itself. It was reported grown in Arkansas, Delaware, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Missouri, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia.

Hedge Prolific, a wheat apparently identical with Poole, but of undetermined origin, was grown by the Indiana Agricultural Experiment Station as early as 1884 (*135*, p. 4). It is not known to be commercially grown now.

Hundred Mark is the name used for Poole in Hocking County, Ohio, for 22 years or more. The same name is sometimes used for the Prosperity variety in Indiana. Hydro Prolific is the name under which a sample of Poole was obtained from Rosedale, Ind. Mortgage Lifter is a local name applied to Poole wheat in Pennsylvania. Nissley (originally Nissley's Hybrid) is an old name for a wheat apparently identical with Poole. It has been grown at the Arlington Experimental Farm, Va., since 1913. As far as known it is not now commercially grown.

Oregon Red Chaff is a name used for Poole in Illinois. Red Amber is a name used for Poole in Pennsylvania. Red Chaff is a common synonym of Poole because of its brown glumes. Red Fultz is a name often but wrongly applied to Poole wheat in Indiana, Ohio, and Kansas. Red King and Winter King are confusions of the name Harvest King, a synonym of Poole. A sample of Winter King was obtained from Mulberry, Ind., in 1919.

Red Russell is a synonym for Poole in Michigan. Royal Red Clawson is apparently identical with Poole, but of undetermined origin. It is known to have been grown commercially in New York several years ago, but probably has now disappeared from cultivation. Sweet Water Valley is the name under which a sample of Poole was obtained from Greene County, Tenn. Wagner is a name used for Poole in Indiana.

PORTAGE.

Description.—This variety is similar to Poole except in having a stiffer straw and a higher yield and quality.

History.—Portage is a pure-line selection of Poole developed at the Ohio Agricultural Experiment Station. It is recommended by the Ohio station as a high-yielding wheat superior to Poole for milling and bread making (*205*, p. 478–481).

Distribution.—Grown in New York, Ohio, and Pennsylvania.

RUSSIAN RED.

Description.—Russian Red differs slightly from Poole in having more persistent glumes which have more triangular shoulders and longer beaks.

History.—This variety usually is grown under the name "Red Russian," but as other varieties are known by this name it is here designated as Russian Red. The following history of Red Russian wheat was reported by E. H. Collins, who was offering the seed for sale in 1898:

> In answers to questions, allow me to say that the Red Russian wheat I advertise in the Farmer was selected by an agent sent by the American Seed Co.,

of Rochester, N. Y., to Russia to secure their best wheat. It was introduced in this section by a prominent mill in Indianapolis at $1.50 a bushel. They paid 1 cent extra for a few years to encourage its more general introduction. It has of late years sold at the seed stores at a 2-cent premium and does this year. It is hardy, smooth, medium hard, and very productive. The only fault I found in growing it 12 years is that it shatters when cut dead ripe, so that I often grow half of my crop Fultz, which can wait. Lately, however, I grow all Russian (*73*, p. 7).

The Red Russian variety was grown by the Ohio Agricultural Experiment Station as early as 1888 (*113*, p. 29). It was distributed widely by Peter Henderson & Co. (*110*), seedsmen, of New York City, and J. A. Everitt & Co. (*89*), seedsmen, of Indianapolis, Ind., in the early nineties.

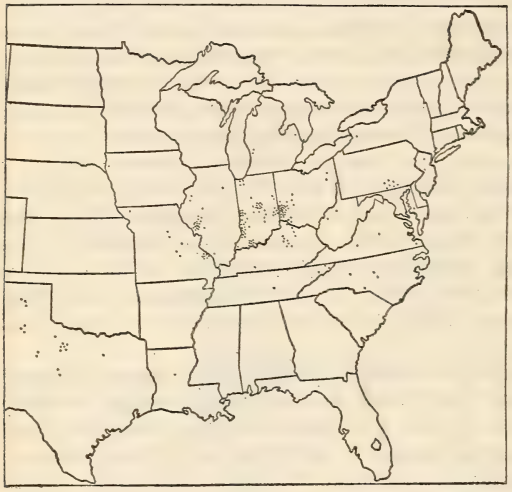


FIG. 43.—Outline map of the eastern United States, showing the distribution of Russian Red wheat in 1919. Estimated area, 172,000 acres.

Distribution. — Grown in Illinois, Indiana, Kentucky, Michigan, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Virginia, and West Virginia. (Fig. 43.)

Synonym.—Red Russian.

CHINA.

Description. — Plant winter habit, late, tall; straw purple, weak to midstrong, spike awnless, fusiform, middense to lax, inclined; glumes glabrous, brown, midlong, midwide; shoulders narrow to midwide, usually rounded; beaks wide, obtuse, 0.5 mm. long; apical awns few, 3 to 12 mm. long; kernels red, short to midlong, soft, ovate to elliptical, tip end usually flattened, ventral side slightly dished; germ small; crease narrow to midwide, shallow to middeep; cheeks rounded; brush small, midlong, collared.

China differs principally from Currell in being taller and later and in having a different shaped kernel, as shown in the descriptions. Spikes, glumes, and kernels of China wheat are shown in Plate XXIX, *A*.

History.—In 1851 the Rural New Yorker gave the following account of the origin of "China" wheat, which appeared for the first time in the Niagara Democrat:

> The kernels from which they (specimens) grew were originally brought from China some six years ago (1845). The seed was handed to Mr. Caverns by O. Turner, the popular local historian, who obtained them from the then lately returned Minister to China, Hon. Caleb Cushing. From a small quantity received by Mr. Caverns for experiment, an amount sufficient to give it extensive and permanent culture has been received.

Several other histories of the origin of "China" wheat are recorded in literature, but the above is thought to be the correct history of the variety here described.

Distribution.—Grown in Illinois, Indiana, Kentucky, Maryland, New Jersey, Pennsylvania, Virginia, and West Virginia. The distribution is shown in Figure 44.

Synonyms.—Bluestem, Lebanon Valley, Mortgage Lifter, and Pennsylvania Bluestem. Bluestem and Pennsylvania Bluestem are names widely used for China in the States where it is grown. A. H. Hoffman, seedsman, of Landisville, Pa., has distributed the variety in that State under the name Pennsylvania Bluestem.

Lebanon Valley is the name under which a sample of China was obtained from R. Chester Ross, of Honey Brook, Pa., who stated that the variety "Originated in Lebanon Valley, Pa."

Mortgage Lifter is the name under which a sample of China was obtained from the Cornell University station in 1912.

WHEEDLING.

Description.—Plant winter habit, late, midtall to tall; stem purple, strong; spike awnless, oblong-fusiform, middense, erect; glumes glabrous, light brown, midlong to long, midwide; shoulders wanting to narrow, oblique; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns few, 3 to 15 mm. long; kernels red, midlong, soft, ovate; germ midsized; crease midwide, middeep; cheeks angular; brush small, midlong.

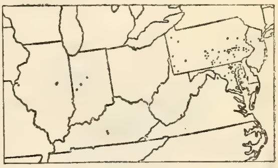


FIG. 44.—Outline map of a portion of the eastern United States, showing the distribution of China wheat in 1919. Estimated area, 63,900 acres.

Wheedling differs from China in being shorter and in having a more erect spike and narrower shoulders.

History.—"This variety was originated about 18 years ago (1890) by Louis Wheedling, of Indiana. Mr. Wheedling, while walking in his wheat field, noticed some heads slightly different from the surrounding ones. These he selected, and from them came the variety that bears his name" (*122*, p. 90).

Distribution.—Grown in Cass, Clinton, Elkhart, Marshall, and St. Joseph Counties, Ind.

RED MAY.

Description.—Plant winter habit, early, midtall to tall; stem purple, midstrong; spike awnless, usually oblong, middense, erect to inclined; glumes glabrous, brown, short to midlong, wide; shoulders wide, usually square; beaks narrow, triangular, 0.5 mm. long; apical awns few, 3 to 12 mm. long; kernels red, usually short, soft, ovate; germ midsized; crease midwide to wide, middeep to deep; cheeks usually angular; brush usually small, midlong.

Red May differs from Poole and China in being earlier and in having a broader and more oblong spike and wider glumes with squarer shoulders. The glumes and shoulders of Red May also are wider than those of Wheedling. Spikes, glumes, and kernels of Red May wheat are shown in Plate XXIX, *B*.

History.—The Red May is believed to be identical with or descended from the Red or Yellow Lammas. Several writers have suggested the identity. Tracy (*195*, p. 396) mentions Yellow Lammas as being a synonym of Red May. The Lammas was mentioned by Koernicke and Werner (*133*, p. 253 and 290) as being a very old English wheat grown previous even to 1699. Both the Red and Yellow Lammas were grown in Virginia many years before the Revolutionary War. A White May wheat of a later period, according to Cabell (*56*,

p. 14), was grown in Virginia as early as 1764. A more recent history of Red May indicates that it was originated by General Harmon from the Virginia May (a white-kerneled wheat) about 1830 (*103*, p. 226). This wheat has been grown quite widely under the name Red May since 1845.

Distribution.—Grown in Alabama, Arkansas, Georgia, Illinois, Iowa, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Nebraska, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia, and under the synonyms in Connecticut, Indiana, Michigan, Minnesota, Ohio, Pennsylvania, West Virginia, and Wisconsin (Fig. 45).

Synonyms.—Beechwood (in part), Canadian Hybrid, Early Harvest, Early May, Early Ripe, Enterprise, Jones Longberry, May, Michigan Amber, Michigan Wonder, Orange, Pride of Indiana, Red Amber, Red Cross, Red Republic, and Republican Red.

Beechwood usually is a mixed wheat containing some Red May. For a history of the wheat, see Poole. Canadian Hybrid is the name under which a sample of Red May was obtained from Illinois in 1919. The name Canadian Hybrid usually is used as a synonym of Jones Fife.

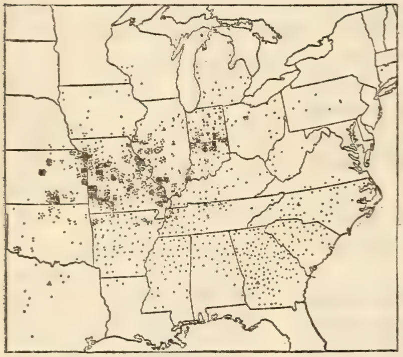


FIG. 45.—Outline map of the eastern United States, showing the distribution of Red May wheat in 1919. Estimated area, 1,165,900 acres.

Early Harvest differs from Red May only in having a shorter and more oblong spike. Its history is not known, but the name apparently came into use by farmers of Indiana and Illinois in the late eighties. It was reported as grown in 1919 in Indiana, Kansas, Kentucky, Michigan, Missouri, and Ohio.

Early May was commonly used as a synonym for both Red May and White May from 1843 to 1857. In 1854 a White May variety in addition to the one already discussed is claimed to have been originated by Charles H. Boughton, Center Crossroads, Essex County, Va. This was also known as Boughton and Tappahannock. The name Early May is now probably used partly for Red May, but principally as a synonym for the Little May or Flint. It was reported in 1919 from Alabama, Arkansas, and South Carolina.

Early Ripe was recorded as having been introduced into Darke County, Ohio, in 1840. During the next 18 years it became distributed over the State as Whig, Kentucky Red, and Carolina (*131*, p. 142). It apparently has continued in cultivation. Samples obtained from the Ohio and Missouri Agricultural Experiment Stations are identical with Red May. It was reported in 1919 from Illinois, Indiana, and Ohio.

Enterprise apparently is identical with Red May. It was obtained from the Indiana Agricultural Experiment Station, which received it from W. C. Betts, Forest, Ind. Its further history is undetermined. Enterprise wheat was reported from Hickman County, Ky., in 1919.

Jones Longberry is the name under which a sample of Red May was obtained from the Missouri Agricultural Experiment Station. It evidently is wrongly applied to this wheat, as the two varieties of Longberry wheat put out by A. N. Jones, of New York, are awned varieties.

May is now used most commonly as a synonym for Red May, although it probably was originally a white-kerneled wheat of earlier origin than Red May.

The name is also known to be used for other varieties. The distribution of May wheat was combined with Red May, as most correspondents used the names as synonymous.

Michigan Amber was grown on the eastern farm of the Pennsylvania Agricultural College, in Chester County, Pa., as early as 1871 (*8*, p. 134). Concerning the variety, the Farmers' Advocate, London, Ontario, published the following statement, which was republished in the Rural New Yorker in 1875 (*11*, p. 186–187):

> Michigan Amber, or Rappahannock, is of an amber color; growth and appearance otherwise resembling the Midge-proof variety.

Our samples of the variety are similar to Red May, with the possible exception of being a few days later in maturity. This might easily be due to the fact that Michigan Amber wheat has been grown farther north than the Red May for a period of nearly 50 years. Reported in 1919 from Arkansas, Illinois, Indiana, Kansas, Kentucky, Missouri, Ohio, Texas, and West Virginia.

Michigan Wonder was reported as one of the highest yielding wheats at the Missouri Agricultural Experiment Station in 1911 (*146*, p. 211). Our samples are the same as Red May, except that they are slightly more erect. It is reported grown in Michigan and Missouri.

Orange wheat was reported as having been introduced into Monroe County, N. Y., from Virginia in 1845 (*102*, p. 286). In 1857 Klippart (*131*) reported Orange wheat as a beardless, white-grained winter wheat grown in Ohio. The wheat now grown as Orange, however, has red kernels and apparently is identical with Red May. It is reported as one of the excellent-yielding beardless varieties of wheat for Missouri in 1910 (77, p. 67). Reported grown in Arkansas, Illinois, Kentucky, Missouri, and Oklahoma.

Pride of Indiana wheat obtained from the Indiana and Missouri Agricultural Experiment Stations is the same as Red May. The origin of the wheat is undetermined. Possibly the name became used for wheat through error, as it is a name of an important variety of corn in Indiana. It was reported in 1919 as grown in Indiana and Pennsylvania.

Red Amber is a name used by growers for Red May or Michigan Amber. A sample of Red Amber identical with Red May was obtained from Georgia in 1919.

The name Red Cross is sometimes wrongly applied to Red May wheat. Since 1893 the John A. Salzer Seed Co., seedsmen, of La Crosse, Wis., have been selling a wheat under the name Red Cross which is apparently identical with Red May. They bought the seed from a J. J. Barron, who claimed to have originated it (*163*, p. 17). This he states was done by crossing three varieties. No evidence is given, however, to prove that the crosses were made.

Red Republic and Republican Red are names used by growers for the Red May or Michigan Amber wheat in Illinois, Missouri, and Tennessee. Samples under these names were obtained from Illinois and Missouri in 1919.

ILLINI CHIEF.

Description.—Plant winter habit, midseason to late, tall; stem purple, strong; spike awnless, oblong, middense, erect to inclined; glumes glabrous, brown, midlong, midwide; shoulders wide, usually square; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns few, 3 to 10 mm. long; kernels red, short to midlong, soft, ovate; germ midsized; crease wide, middeep to deep; cheeks usually angular; brush midsized, midlong.

Illini Chief is very similar to Red May, but differs slightly in being taller and later. It was originally mixed with Jones Winter Fife and with pubescent brown-glumed strains, most of which were heterozygous. Illini Chief is reported to be very resistant to Hessian fly injury.

History.—Illini Chief wheat was first distributed in the fall of 1915, by E. L. Gillham, Edwardsville, Ill. He advertised the variety as resistant to Hessian fly, stating "that it does practically resist Hessian fly attack." (*95*.)

Further history of Illini Chief wheat is recorded as follows:

> Ed. Gillham, who was the first man to grow the wheat, bought the seed nine years ago from a neighbor by the name of Finley, and it is still known as Finley wheat in Madison County (*31*, p. 5).

Finley was reported in 1919 from Kansas, Missouri, and Ohio. The name Finley was in use in the early eighties for an awnless variety with white, glabrous glumes and red kernels (*81*, p. 29). This wheat apparently has now gone out of cultivation.

A second article in the Prairie Farmer by Dr. S. A. Forbes (*90*), State Entomologist of Illinois, contains the following sentence: "Mr. Gillham has traced his original stock to an Ohio farmer, who called it Early Carlyle." No wheat was reported under this latter name in the survey.

Distribution.—Grown as Illini Chief in Illinois and Missouri and as Finley in Kansas and Ohio.

Synonyms.—Early Carlyle and Finley.

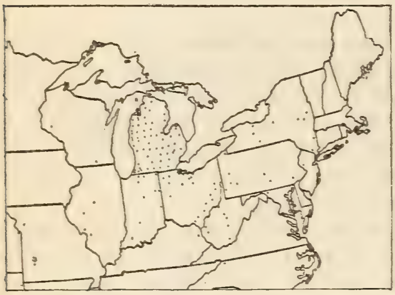


FIG. 46.—Outline map of the northeastern United States, showing the distribution of Red Clawson wheat in 1919. Estimated area, 80,900 acres.

RED CLAWSON (EARLY RED CLAWSON).

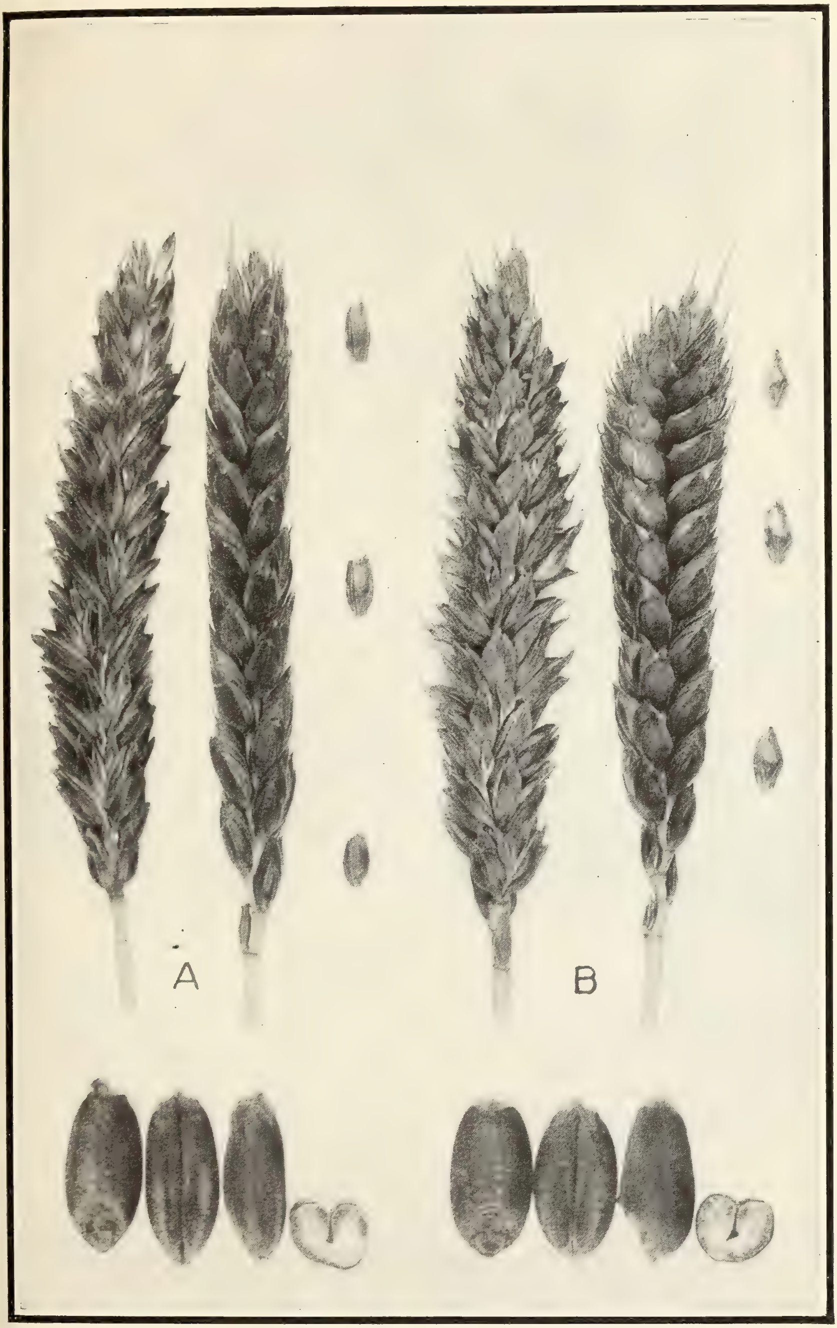
Description.—Plant winter habit, midseason, midtall; stem purple, strong; spike awnless, oblong to linear clavate, middense, erect to inclined; glumes glabrous, brown, midlong, midwide; shoulders midwide to wide, usually square, sometimes rounded or oblique; beaks midwide, obtuse, 0.5 to 1.0 mm. long; apical awns few, 5 to 15 mm. long; kernels pale red, midlong, soft, ovate to elliptical; germ small to midsized; crease midwide, shallow to middeep; cheeks rounded to angular; brush midsized, midlong.

Differs from Red May in being later and in having a slightly longer and more clavate spike, narrower glumes, and a longer kernel. Spikes, glumes, and kernels of Red Clawson wheat are shown in Plate XXX, *A*.

History.—Red Clawson was originated in 1888 as the result of a cross between Clawson, a white wheat, and Golden Cross, made by A. N. Jones, of Newark, Wayne County, N. Y. (*58*). It was advertised and distributed by Peter Henderson & Co. (*110*), seedsmen, of New York City, as early as 1889.

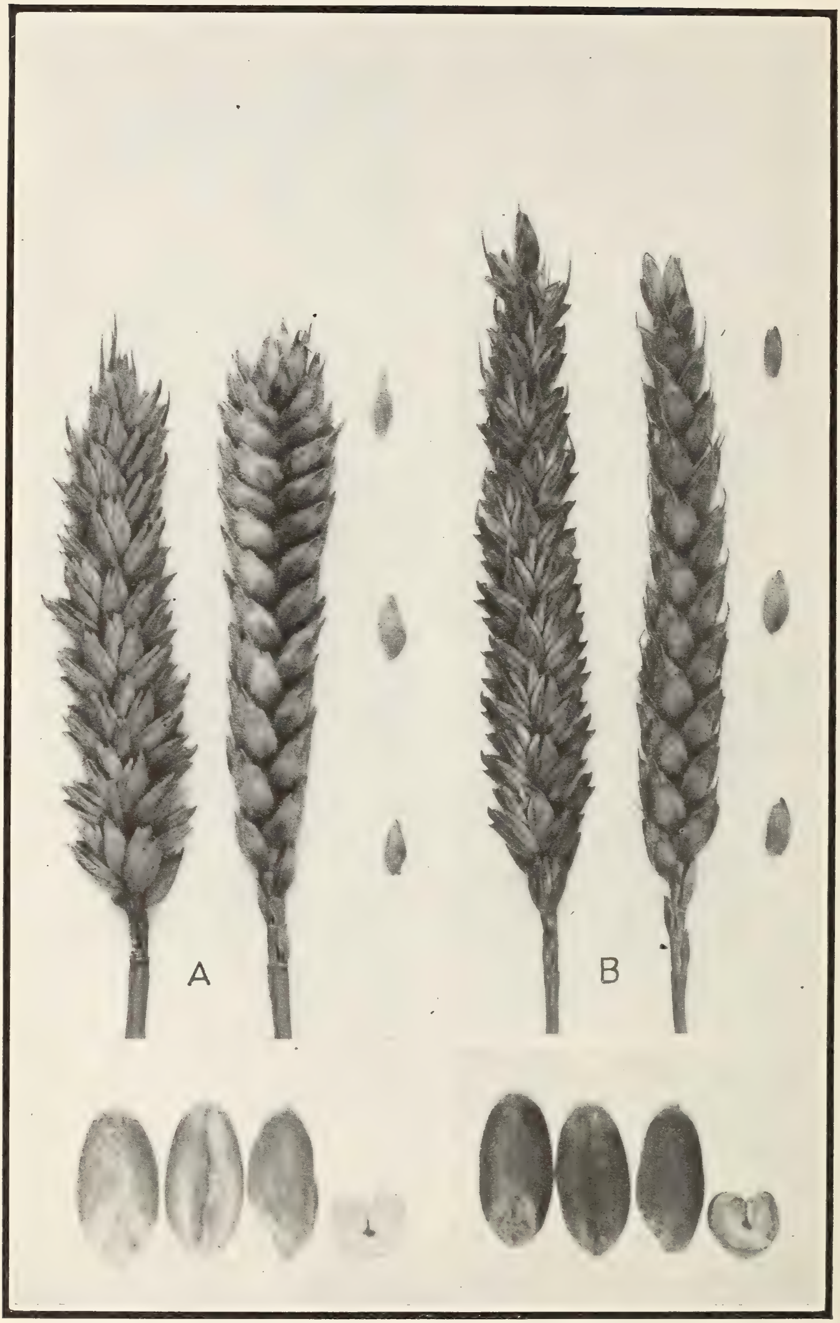
Distribution.—Grown in Idaho, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, West Virginia, and Wisconsin. (Fig. 46.)

Synonyms.—Clawson, Early Red Clawson, and Zeller's Valley. The name Clawson properly is applied only to the white-kerneled wheat which was one parent of the Red Clawson, but sometimes is used for Red Clawson. Zeller's Valley is the name under which a sample of wheat nearly identical with Red Clawson was obtained in 1919 from Sharpsburg, Md., where it was reported the variety had been grown for 40 years.



RED CLAWSON (A). ROCHESTER (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



SILVERCOIN (A). TRIPLET (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

ROCHESTER (ROCHESTER RED).

Description.—Plant winter habit, midseason, midtall; stem purple, strong, stout; spike awnless, very clavate, dense, erect; glumes glabrous, brown, midlong to long, midwide; shoulders wide, oblique to square; beaks midwide, obtuse, 0.5 to 1 mm. long; apical awns several, 3 to 20 mm. long; kernels red, small to midlong, soft, ovate, humped; germ small; crease midwide, middeep, pitted; cheeks rounded; brush midsized, midlong to long.

Rochester wheat has an extremely dense, clavate spike which distinguishes it from most other varieties. Spikes, glumes, and kernels of Rochester wheat are shown in Plate XXX, *B*.

History.—The origin of this variety is undetermined. It was advertised by Henderson (*110*) as early as 1891.

Distribution.—Grown as Rochester Red in Monroe County, N. Y., and as Pride of the Valley in Morris County, N. J.

Synonyms.—Pride of the Valley and Shepherd's Tennessee Fultz. A wheat called Pride of the Valley, identical with Rochester, was obtained from Morris County, N. J., in 1919, where it had been grown for eight years. Shepherd's Tennessee Fultz is of undetermined origin. A sample under this name, but apparently identical with Rochester, was obtained in 1912 from the Cornell University Agricultural Experiment Station, which had received it from Indiana. It is not known to be commercially grown.

RED CHIEF (EARLY RED CHIEF).

Description.—Red Chief is nearly identical with Rochester, but the spike is not quite as dense.

History.—Early Red Chief is reported by Henderson (*110*, 1903) to have originated from Early Red Clawson and Red Arcadian. By whom it was originated is not stated.

Distribution.—This variety is not known to be grown commercially at the present time. Samples were obtained from the Cornell University Agricultural Experiment Station.

SCHLANSTEDT (RIMPAU'S RED SCHLANSTEDTER SOMMERWEIZEN).

Description.—Plant spring habit, late, tall; stem very glaucous before maturity, white, midstrong; spike awnless, fusiform, sometimes nearly oblong, middense, erect to inclined; glumes glabrous, brown, midlong, midwide; shoulders wanting to midwide, oblique; beaks wide, incurved, acute, 1 mm. long; apical awns few, 3 to 10 mm. long; kernels red, short to midlong, soft, ovate; germ midsized; crease narrow to midwide, shallow to middeep, triangular; cheeks angular; brush midsized, midlong.

This variety is distinguished from other brown-glumed, red-kerneled spring wheats by the glaucous stem and leaves.

History.—Schlandstedt is a spring form of wheat originated by Dr. Wilhelm Rimpau in 1889 at Schlanstedt, Germany, from a Bordeaux winter wheat (*142*, p. 192). A sample of this variety was introduced by the United States Department of Agriculture in 1909, but was not distributed. A field of the variety was found growing 9 miles north of Reardan, Wash., by a member of the Portland laboratory of the office of grain standardization, United States Department of Agriculture, in the summer of 1915. The history of its introduction is not known.

Distribution.—Grown to a very limited extent in Washington.

RESACA (RED RESACA).

Description.—Plant spring habit, midseason, midtall; stem purple, weak to midstrong; spine awnless, fusiform, narrow, middense, inclined; glumes glabrous, brown, midlong, narrow; shoulders narrow, oblique to square; beaks midwide, obtuse, 0.5 mm. long; apical awns few, 2 to 15 mm. long; kernels red, short, soft, ovate; germ small; crease midwide, shallow to middeep; cheeks rounded; brush midsized, short.

This variety is very similar to Odessa except in having a spring habit and purple straw and in being slightly earlier.

History.—The origin of Resaca wheat is not known. The sample described was obtained from C. P. Warner, Lake Victor, Tex., in 1919. He wrote as follows:

> The pure Red Resaca was introduced in this county (Burnet County, Tex.) some 30 years ago by S. W. Shelburne, and has not been grown extensively. It perhaps does not produce as much as the Mediterranean.

Distribution.—Grown in Burnet County, Tex.

STANLEY.

Description.—Plant spring habit, midseason to late, tall; stem white, strong; spike awnless, fusiform, lax, erect, shatters; glumes glabrous, brown, midlong, narrow; shoulders wanting to narrow, oblique; beaks narrow, sometimes wanting, usually acute, 0.5 mm. long; apical awns few, 3 to 10 mm. long; kernels red, short to midlong, semihard to hard, ovate; germ midsized; crease midwide, shallow to deep, triangular; cheeks angular; brush midsized, midlong.

This variety differs from all other varieties of brown-glumed awnless winter and spring, red-kerneled wheats in having semihard to hard kernels.

History.—The Stanley originated about 1895 from the progeny of a cross made by Dr. William Saunders, Dominion cerealist, Ottawa, Canada. "The Stanley is a twin wheat with the Preston, both having had origin in the one kernel" (*169*, p. 14). "Parentage Ladoga (female) crossed with Red Fife (male)" (*164*, p. 219). An awned, white-glumed, white-kerneled winter wheat also has been grown under the name Stanley (*204*, p. 38).

Distribution.—Grown under irrigation in the Gallatin Valley of Montana and experimentally in Minnesota.

SILVERCOIN.

Description.—Plant winter habit, midseason, short to midtall; stem white, strong; spike awnless, clavate, dense, erect to inclined; glumes pubescent, white, midlong, midwide; shoulders midwide, oblique to square; beaks wide, obtuse, 1 mm. long; apical awns few, 3 to 10 mm. long; kernels white, short to midlong, soft; ovate to oval; germ midsized; crease midwide, middeep; cheeks angular to rounded; brush midsized, midlong.

Spikes, glumes, and kernels of Silvercoin wheat are shown in Plate XXXI, *A*.

History.—According to Mr. M. L. Peterson, Mendon, Cache County, Utah, Silvercoin wheat originated in a dry-land field of mixed Goldcoin and Sonora, belonging to Eph. Hansen, a few miles from Mendon, about 1900. The wheat was selected, increased, and distributed and became known as Eph. Hansen wheat, but the name later was changed to Silvercoin, though when and by whom is not known. The variety probably is the result of a natural field hybrid between Goldcoin and Sonora.

Distribution.—Grown in Boxelder and Cache Counties, Utah.

Synonym.—Hansen. As stated above, Hansen is the name of the man who is said to have originated Silvercoin wheat. The variety is still known as Hansen by some growers in Cache County, Utah.

JUMBUCK.

Description.—Plant spring habit, midseason, midtall; stem white, strong; spike awnless, oblong-fusiform, middense, erect; glumes pubescent, white, midlong, midwide to wide; shoulders wide, usually square; beaks midwide, acute, 0.5 to 1 mm. long; apical awns few, 3 to 20 mm. long; kernels white, short to midlong, semihard to hard, ovate; germ midsized; crease midwide, middeep to deep; cheeks rounded; brush midsized, midlong.

History.—Jumbuck is one of William Farrer's Australian varieties, produced by hybridization. Its origin has been recorded as follows:

> Jumbuck was produced as the result of crossing Improved Fife by Tardent's Blue, and then mating the progeny with Lambrigg Australian Talavera. Its pedigree is—
>
> Improved Fife × Tardent's Blue.
> Unnamed × Lambrigg Australian Talavera.
> Jumbuck.
>
> It received its name "Jumbuck" (a country name for a sheep) because of the woolly appearance of its chaff (*188*, p. 284.)

This variety was introduced into the United States about 1911 from New South Wales by the California Agricultural Experiment Station.

Distribution.—Grown in experiments by the California Agricultural Experiment Station and said to be commercially grown to a small extent in California.

INDIAN.

Description.—Plant spring habit, early, short; stem white, weak to midstrong; spike awnless, oblong, dense, erect; glumes pubescent, white, midlong, midwide, easily shattered; shoulders narrow, oblique to elevated; beaks narrow, acuminate, 1 to 3 mm. long; apical awns several, 3 to 5 mm. long; kernels white, short, soft, ovate to oval; germ small; crease midwide, shallow; cheeks usually rounded; brush small, short.

Indian differs from Sonora only in having white instead of brown glumes.

History.—The origin of Indian wheat is not definitely known. It probably is the result of a natural field hybrid between Sonora and some other variety. It is a common mixture in the Sonora variety, although it has been separated and grown by itself for many years. George L. Little, jr., of Morgan, Morgan County, Utah, reported in 1917 that the origin of the variety was not known, but that it had been grown in his county for 40 or 50 years.

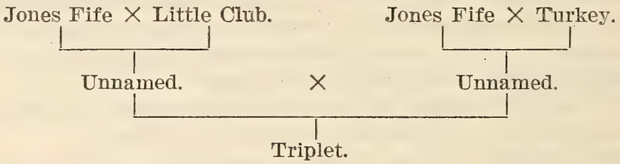
Distribution.—Grown to a limited extent in Arizona and in Summit and Morgan Counties, Utah.

TRIPLET.

Description.—Plant winter habit, midseason, midtall; stem white, midstrong; spike awnless, oblong-fusiform, middense, inclined; glumes pubescent, white, midlong, midwide; shoulders midwide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns few, 3 to 8 mm. long, sometimes incurved throughout spike; kernels red, short to midlong, semihard, ovate; germ small; crease narrow to midwide, shallow; cheeks rounded; brush small, midlong.

Triplet differs from Jones Fife in being slightly shorter and earlier and in having a harder kernel with a smaller germ and rounded rather than angular cheeks. Plate XXXI, *B*, shows spikes, glumes, and kernels of the Triplet variety.

History.—Triplet was originated at the Washington Agricultural Experiment Station, Pullman, Wash., from a combination of crosses in which Jones Fife, Little Club, and Turkey were used as parents. Its pedigree is as follows:



It was first grown as a pure strain in 1910 and was distributed for commercial growing in 1918, after it had proved to be a high-yielding variety in nursery and plat experiments at Pullman.

Distribution.—Grown at experiment stations in the Pacific Northwest and commercially in Oregon and Washington in 1920.

MEALY.

Description.—Plant winter habit, midseason, midtall to tall; stem white, midstrong to strong; spike awnless, oblong-fusiform, middense, inclined; glumes pubescent, white, midlong, midwide; shoulders midwide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns few, 3 to 10 mm. long; kernels red, midlong, semihard, ovate; germ midsized; crease wide, deep; cheeks angular; brush large, long.

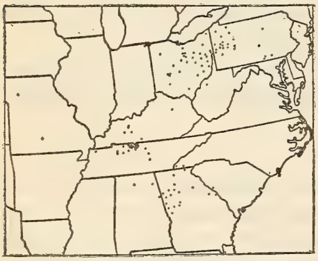


FIG. 47.—Outline map of a portion of the eastern United States, showing the distribution of Mealy wheat in 1919. Estimated area, 65,500 acres.

Mealy differs from Triplet in being slightly taller and later, with stronger stems and in having kernels with more angular cheeks and larger and longer brush. Kernels, spikes, and glumes of Mealy wheat are shown in Plate XXXII, *A*.

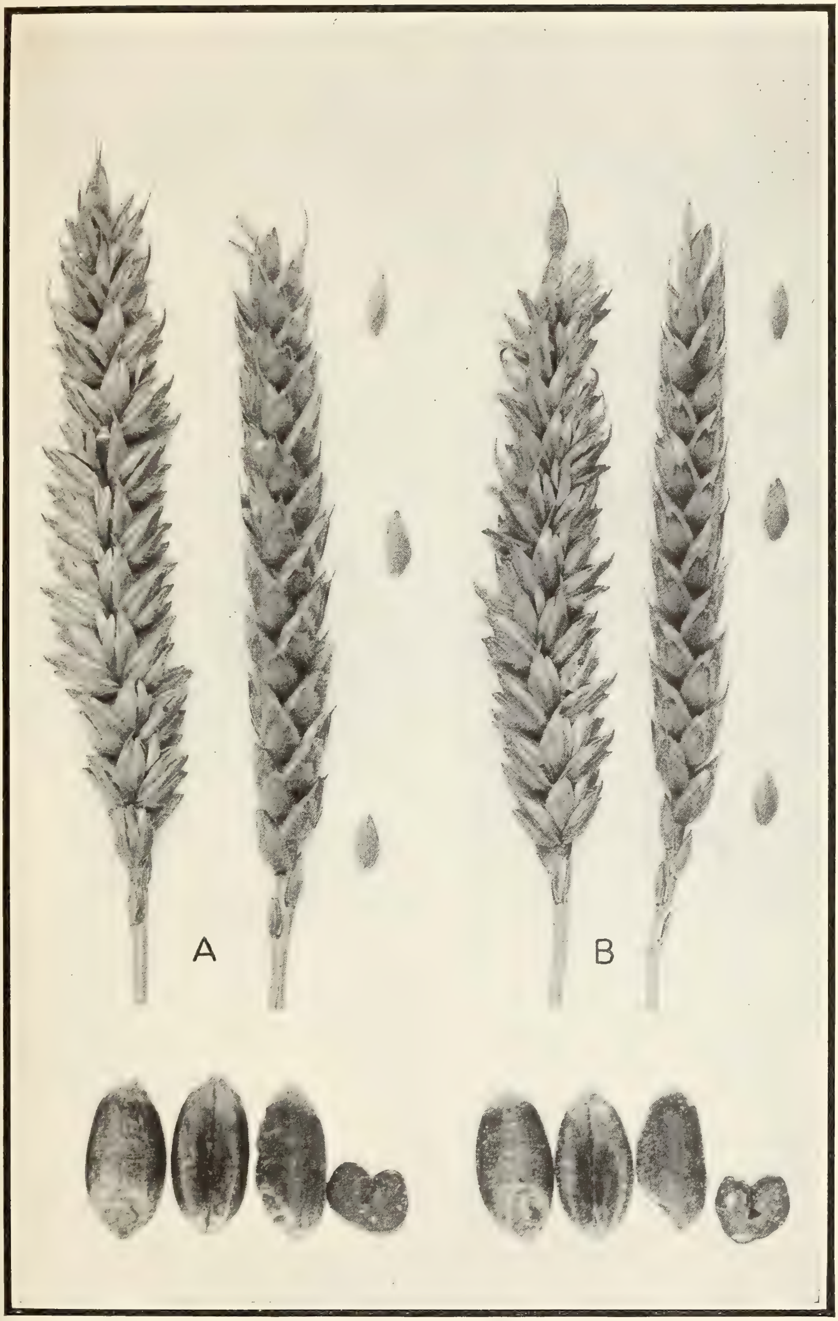
History.—This variety was distributed by the United States Department of Agriculture in 1885, and for several years thereafter, and the following record of its origin accompanied the seed:

> Originated by M. A. Mealy, in 1880, by planting the kernels of three heads of wheat selected from a growing crop of Fultz. It is similar to other varieties known as White Velvet Chaff; is of fair promise and is said to excel the Fultz in yield and flouring qualities (57, p. 19).

Distribution.—Grown in Alabama, Georgia, Indiana, Kentucky, Missouri, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and West Virginia. (Fig. 47.)

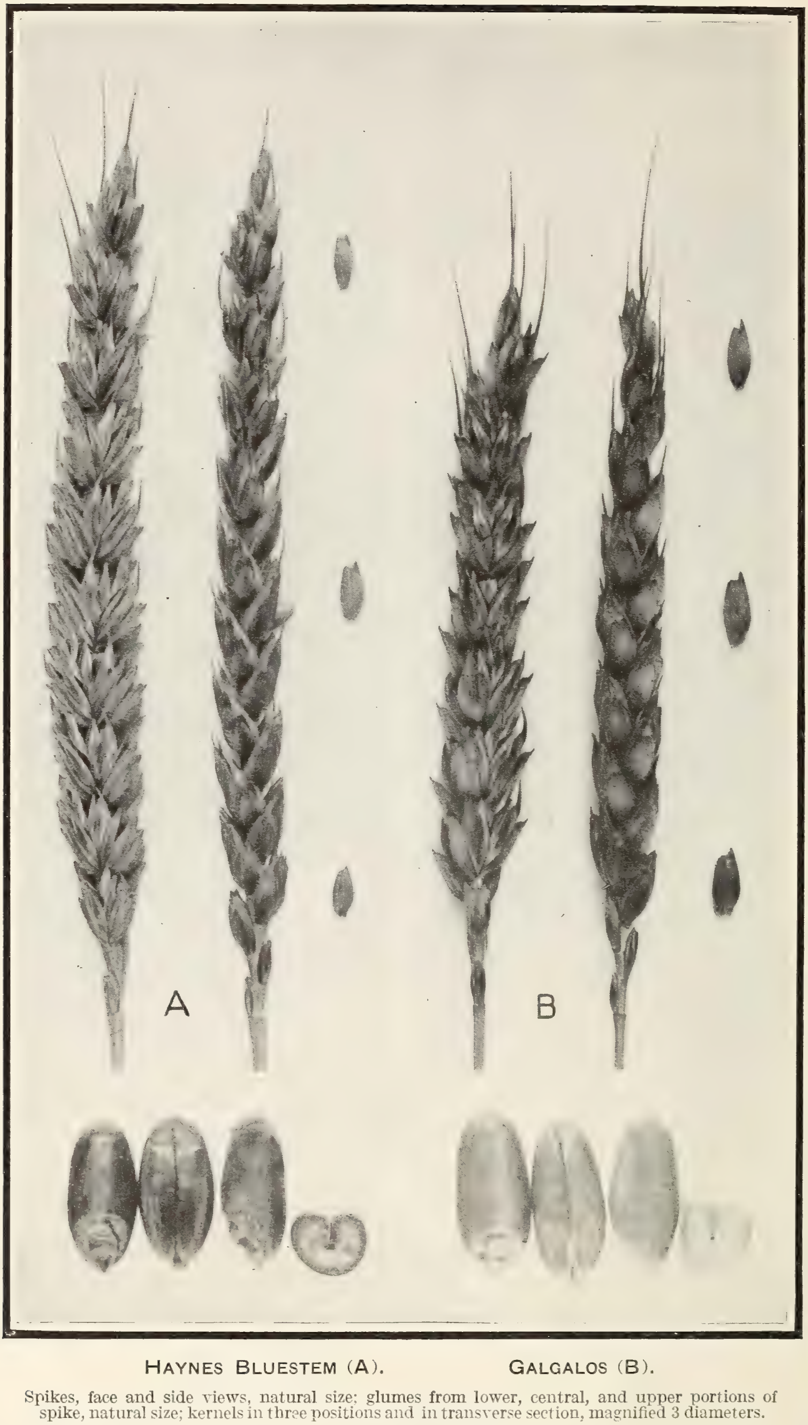
Synonyms.—Velvet Chaff, Velvet Head, White Velvet Chaff.

Velvet Chaff and Velvet Head are common farm names for Mealy wheat. White Velvet Chaff was the name of a wheat grown previous to the origin of Mealy, but the varieties probably were identical. The wheat evidently has disappeared from cultivation under this name.



MEALY (A). JONES FIFE (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



HAYNES BLUESTEM (A). GALGALOS (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

JONES FIFE (JONES WINTER FIFE).

Description.—Plant winter habit, midseason, midtall; stem white, midstrong; spike awnless, oblong-fusiform, middense, nodding; glumes pubescent, white, midlong, midwide to wide; shoulders midwide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns few to several, lower ones often incurved, 3 to 8 mm. long; kernels red, short to midlong, soft to semihard, ovate, humped; germ midsized, abrupt; crease midwide to wide, middeep to deep; cheeks angular; brush midsized, midlong.

This variety differs from Mealy principally in having a nodding spike and a softer kernel. It makes a comparatively weak flour for bread making. Spikes, glumes, and kernels of Jones Fife wheat are shown in Plate XXXII, *B*.

History.—Jones Fife (Jones Winter Fife) was originated by A. N. Jones, of Newark, Wayne County, N. Y., in 1889.[16] According to Carleton (*61*, p. 221), "it descended from Fultz, Mediterranean, and Russian Velvet."

Distribution.—Grown as Fife, Jones Fife, or Jones Winter Fife in Idaho, Illinois, Indiana, Iowa, Kentucky, Michigan, Missouri, Montana, Ohio, Pennsylvania, Utah, Virginia, Washington, and West Virginia, and as synonyms in Colorado and Wyoming. This distribution is shown in Figure 48.

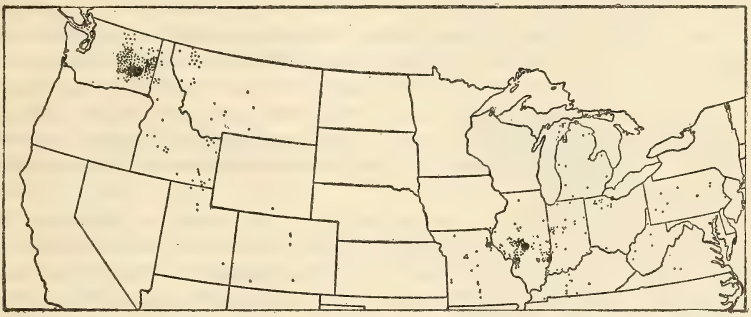


FIG. 48.—Outline map of the northern United States, showing the distribution of Jones Fife wheat in 1919. Estimated area, 476,100 acres.

Synonyms.—Burbank's Super, Canadian Hybrid, Crail Fife, Fife, Fishhead, Silver King, Super, Velvet Chaff, Winter Fife.

Burbank's Super, or Super wheat, was first distributed by Luther Burbank, of Santa Rosa, Calif., in the fall of 1917. The following is Mr. Burbank's first statement regarding this variety, published in August, 1917, in his catalogue under the title "The New Burbank Wheat" (*51*):

> It is with unusual satisfaction that I now offer for the first time a limited quantity of my new wheat; the best result of 10 years of most careful and expensive experiments. It has been tested alongside of 68 of the best wheats of the world, and has excelled them all in yield, uniformity, and other desirable characteristics; the growth is strong, 4 feet on good ordinary soil, tillers unusually well, and on ordinary valley soil, without special cultivation, care, or fertilizing, this summer produced at the rate of forty-nine and 88–100 bushels per acre, every plant and every kernel uniform, as this wheat was originally all grown from one single kernel. Even at present prices of ordinary wheat for milling purposes, it will be readily seen that the crop of each acre would purchase an acre of the best wheat land.
>
> The small field of this new wheat has been the wonder and surprise of thousands who have seen it, nothing like it in uniformity and beauty ever having been seen before. The cut shows the exact size and appearance of the long, smooth, white, well-filled heads. Every kernel is guaranteed uniform and correct to type.

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[16] Printed stationery of A. N. Jones.

> This, like all other wheats grown in California, is a winter wheat and should probably be generally treated as such, and will, no doubt, thrive better in new localities after it becomes acclimated by one or two seasons' growth. . . . The best successes of my customers are also my own, and the whole wheat crop of America will soon be enormously increased if this new "Burbank" wheat is generally sown.

The wheat was further advertised and distributed as Super wheat in 1917 and 1918 by Mr. Burbank. Apparently most of his stock was purchased and resold by the State Seed & Nursery Co., of Helena, Mont., at the price of $5 per pound. They advertised it as a wheat adapted for both spring and fall sowing. It was distributed, therefore, in many sections where it was not adapted. East of the Rocky Mountains it generally winterkilled when fall sown and remained prostrate on the ground throughout the growing season when spring sown, thus resulting in failure. Its distribution, therefore, probably now is limited to the Pacific coast and the Intermountain areas. It was not reported in the varietal survey of 1919. The writers have found Super wheat to be identical with Jones Fife in all taxonomic characters, as well as in yield and in milling and baking quality.

Canadian Hybrid is similar to Jones Fife, except that it sometimes has a slightly longer and laxer spike. It was listed by John A. Salzer, seedsman, of La Crosse, Wis., as early as 1895. Concerning it he states that "it originated in Canada, on the farm of Clark Parker, through crossing, or in the words of the grower, 'I have long had the best crops of winter wheat in my section. I would take the best specimens of different sorts, and plant them together, and thus continuously improve my yield. Now, I can not call any of these sorts pure, because obtained as above, but can call the Canadian Hybrid enormously productive.'" (*163*, p. 16, 1900.) It was reported grown in Illinois, Indiana, Michigan, and Missouri.

Crail Fife is a local name applied to Jones Fife wheat in Montana, Frank Crail, of Bozeman, Mont., being the farmer who grew and distributed the variety under that name. Fishhead is a wheat similar to Jones Fife, samples of which have been obtained from the Cornell University Agricultural Experiment Station. Silver King is a name used for Jones Fife in Colorado and Wyoming. According to J. B. Hill, of Westridge, Colo., it has been grown in that vicinity for 16 or 18 years. The name Velvet Chaff has been used for Jones Fife, as for several other varieties, by many growers. Winter Fife, a part of the original name, often is used by growers to distinguish it from the well-known spring wheat called Fife.

HAYNES BLUESTEM.

Description.—Plant spring habit, late, midtall to tall; stem white, glaucous before maturity, midstrong to strong; spike awnless, narrowly fusiform, middense to lax, inclined; glumes pubescent, white, short, midlong, narrow, often shattering; shoulders midwide, oblique to square; beaks midwide, obtuse, 0.5 mm. long; apical awns few, 3 to 15 mm. long; kernels red, short to midlong, hard, ovate; germ midsized; crease narrow, middeep to deep; cheeks rounded; brush midsize, midlong to long.

This variety is distinct among the hard spring-wheat varieties because of being pubescent. It is very susceptible to stem rust. When rust is not present it yields well under humid conditions. It is an excellent milling and bread-making wheat. Spikes, glumes, and kernels of Haynes Bluestem are shown in Plate XXXIII, *A*.

History.—Haynes Bluestem was first developed through selection by L. H. Haynes (*107*), of Fargo, N. Dak., about 1895. He recorded the following information concerning its previous origin and his work toward its improvement:

> The wheat now grown in the Northwest, ordinarily known as a Bluestem, was grown 40 years ago (1855) in some Eastern States as a Red Winter wheat. Being semihard when grown in the East, since being changed into a spring wheat and grown in the hard-wheat district of the Northwest, it is now hard and the berry as beautiful an amber as can be found. . . .
>
> In 1882 a friend recommended this wheat to me so highly that I was induced to try it. I bought some and sowed it that year, and grew it again in 1883. I was much pleased with its strong growth and good yield, but one difficulty had to be overcome. It evidently had not had the necessary care to keep it pure and had become mixed with soft and bearded wheats, which rendered it quite objectionable for sowing. To overcome this objection I resolved to grow it pure, knowing that it would take years to do it, yet I thought it would repay the time and trouble in the end. I accordingly commenced by planting in my garden in 1884 the grains from two good heads, having three kernels abreast, hoeing it as it grew. While it was growing, in studying over the matter I came to the conclusion that "blood would tell" in the vegetable as well as the animal kingdom by propagating from the best.
>
> From the product of these two heads I rejected the latest and poorest heads, using only the best and earliest for use upon my trial grounds. . . .
>
> The trial grounds are planted each year with wheat from the choicest heads of the previous year and cultivated, the product being carefully selected, head by head, and the crop, except what is necessary to replant the ground, is sown with the field grain, thereby causing gradual improvement from year to year.[17]

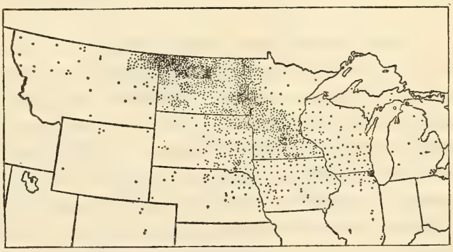

Fig. 49.—Outline map of the north-central United States, showing the distribution of Haynes Bluestem wheat in 1919. Estimated area, 1,530,800 acres.

Mr. Haynes distributed this wheat widely throughout the Dakotas and Minnesota for several years, starting about 1892. As shown in this history, Bluestem wheat was grown in the Dakotas before Mr. Haynes originated his strain. As he has recorded, it probably was grown in the eastern United States as a winter wheat before being grown as a spring wheat in the Northwest. Haynes Bluestem wheat was further improved by the Minnesota Agricultural Experiment Station. A pure-line selection, first known as Minnesota No. 169, was developed and distributed by that institution in the late nineties (*109*, p. 69–72). This strain also has been known as Haynes Bluestem, and is now the principal strain grown under that name. The name Bluestem now is most commonly used for this whole group of Bluestem wheats and also as a farm name for the variety. This is correct in some cases. As the original Bluestem and the strains and pure lines can not be distinguished from each other, the name Haynes Bluestem is used here to distinguish this wheat from five other important varieties of wheat commonly known as Bluestem in the United States and to retain its identity with the old and well-known name Bluestem.

Distribution.—Grown principally as Bluestem in Illinois, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Wyoming, and Wisconsin. Figure 49 shows the distribution of this variety.

Synonyms.—Bluestem, Bolton Bluestem, Marvel Bluestem, Minnesota No. 169, Velvet Bluestem. As shown above, Bluestem was the earliest and is still the most commonly used name for Haynes Bluestem wheat. Bolton Bluestem was obtained originally from Thomas Bolton, of Park River, N. Dak., by the North

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[17] The pamphlet was borrowed from Walter R. Reed, of Amenia, N. Dak.

Dakota Agricultural Experiment Station. It was first grown at that station in 1893. As far as known it was a mass variety. Marvel Bluestem is a name which was applied to Bluestem wheat by J. A. Salzer & Co., seedsmen, of La Crosse, Wis. It is known to have been used at least as early as 1892. Marvel Bluestem was reported in 1919 from Minnesota, South Dakota, and Wisconsin. Minnesota No. 169, as shown above, is a pure-line selection of Haynes Bluestem, developed at the Minnesota Agricultural Experiment Station. Velvet Bluestem is a name used by Carleton (*58*, p. 65–66) for the bulk unselected Bluestem wheat grown in the Northwest.

DAKOTA.

Description.—This variety also is identical with Haynes Bluestem in all morphological characters, but has outyielded it in North Dakota.

History.—The Dakota is a pure-line selection from the original Haynes Bluestem, originated at the North Dakota Agricultural Experiment Station about 1898. It was first called by its number, North Dakota No. 316, later by the name Select Bluestem, and finally was named Dakota.

Distribution.—It was widely grown in North Dakota about a decade ago, but now probably has largely disappeared from cultivation.

Synonyms.—North Dakota No. 316, Select Bluestem.

GALGALOS.

Description.—Plant spring habit, although remaining prostrate during its early growth, midseason, midtall; stem white, slender, weak; leaves pubescent, glaucous; spike awnless, fusiform, lax, inclined; glumes pubescent, light brown, long, midwide; shoulders midwide, oblique to square; beaks wide, acute 1 to 2 mm. long; apical awns many, 3 to 30 mm. long; kernels white, midlong, soft, ovate to elliptical, slightly humped, ventral side rounded; germ small; crease narrow, shallow; cheeks usually rounded; brush midsized, midlong.

This variety is distinguished by its pubescent, brown glumes and pubescent leaves. It is a high-yielding wheat in dry climates and is one of the best white wheats for bread baking. Its weak straw, however, is a serious objection. Spikes, glumes, and kernels of Galgalos wheat are shown in Plate XXXIII, *B*.

History.—Galgalos (S. P. I. No. 9872) was introduced in 1903 by the United States Department of Agriculture (*197*) from the Erivan Government in Transcaucasian Russia,

Distribution.—Grown in Kings, Lassen, Merced, San Luis Obispo, and Shasta Counties, Calif.; and Crook, Grant, Jefferson, Josephine, and Wallowa Counties, Oreg.

Synonyms.—Russian Red, Velvet Chaff. Russian Red is a local name used for Galgalos in Shasta County, Calif., and Velvet Chaff is a local name used for it in Josephine County, Oreg.

SONORA.

Description.—Plant spring habit, early, short to midtall; stem white, strong; spike awnless, oblong, short, dense, erect; glumes pubescent, brown, midlong, midwide, easily shattered; shoulders narrow, usually oblique; beaks narrow, acuminate, 1 to 3 mm. long; apical awns several, 3 to 8 mm. long; kernels white, short, soft, ovate to oval; germ small; crease midwide, shallow; cheeks rounded; brush small, short.

This variety is distinct and peculiar because of its long acuminate beaks. It is usually a poor-yielding variety except in southern California and Arizona, where it appears well adapted. It produces a weak flour, which is mostly used for pastry. Spikes, glumes, and kernels of Sonora wheat are shown in Plate XXXIV, *A*.

History.—Sonora was brought to the United States from Magdalena Mission, northern Sonora, Mexico, where it has been grown for 150 years.[18] It is known to have been grown in the United States for about 100 years, as it is the wheat grown by the Pima and Yuma Indians in Arizona. Several samples of wheat, similar to Sonora, have recently been introduced by the United States Department of Agriculture from South Africa.

Distribution.—Grown in Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington, and Wyoming. (Fig. 50.)

Synonyms.—Ninety-Day, Red Chaff, White Sonora. Ninety-Day is a local name of Sonora wheat in Millard County, Utah, while Red Chaff and White Sonora are names commonly used for it by growers in Idaho and in Utah.

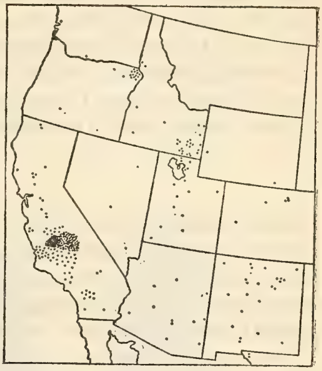

FIG. 50.—Outline map of the western United States, showing the distribution of Sonora wheat in 1919. Estimated area, 243,900 acres.

GRANDPRIZE (ST. LOUIS GRAND PRIZE).

Description.—Plant winter habit, midseason to late, short; stem white, strong; spike awnless, clavate, dense, inclined; glumes pubescent, brown, midlong, wide; shoulders midwide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns several, 3 to 15 mm. long; kernels red, midlong, soft to semihard, broadly ovate to oval; germ midsized; crease usually wide, deep, pitted; cheeks rounded to angular; brush large, midlong to long.

The Grandprize wheat is usually not uniform in shape of spike, a small percentage of oblong spikes usually being present. Spikes, glumes, and kernels of Grandprize wheat are shown in Plate XXXIV, *B*.

History.—Grandprize (St. Louis Grand Prize) was originated by A. N. Jones, of Le Roy, N. Y., between the years 1900 and 1908. It was distributed by Peter Henderson & Co. (*110*), seedsmen, of New York City, in 1910. The wheat derived its name from the fact that Mr. Jones received a grand prize for his cereal exhibit at the St. Louis Exposition in 1904.

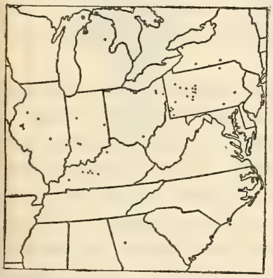

FIG. 51.—Outline map of a portion of the eastern United States, showing the distribution of Grandprize wheat in 1919. Estimated area, 34,100 acres.

Distribution.—Grown in Georgia, Illinois, Indiana, Kentucky, Michigan, New York, Ohio, and Pennsylvania. (Fig. 51.)

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[18] Verbal statement of Prof. W. W. Mackie, January 22, 1919.

Synonyms.—Bull Moose, Golden Chaff, New Genesee, and Velvet Head.

Bull Moose is a recent and local name used for Grandprize wheat in Crawford County, Ill. Golden Chaff is a name used for Grandprize in Indiana. New Genesee is the name under which a wheat similar to Grandprize was obtained from the Wisconsin Agricultural Experiment Station, Madison, Wis., in 1917. Its origin is undetermined. This sample was not pure. It contains a greater percentage of the form having oblong spikes than does Grandprize itself. New Genesee is not known to be commercially grown. Velvet Head is a name under which Grandprize wheat was reported from Kentucky.

DEMOCRAT.

Description.—Plant winter habit, midseason, tall; stem white, strong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide; shoulders wanting to narrow; beaks 1 to 3 mm. long; awns 3 to 6 cm. long; kernels white, midlong, soft, ovate, acute; germ small to midsized; crease usually narrow, shallow to middeep; cheeks angular; brush small, midlong.

Democrat is the only variety of winter wheat having awned white-glumed fusiform spikes and midsized white kernels.

History.—The origin of Democrat wheat is undetermined. It was grown by the Ohio Agricultural Experiment Station as early as 1883. It was obtained by that station from George Burr, of Lodi, Ohio, and at that time was recorded as being a variety quite generally grown in Ohio (*80*, p. 17).

Distribution.—Grown sparingly in Illinois, New York, Ohio, Pennsylvania, and West Virginia.

SENECA CHIEF.

Description.—Plant winter habit, late, short to midtall; stem white, midstrong, stout; spike awned, clavate, dense, inclined; glumes glabrous, white, midlong, midwide; shoulders wanting to narrow, rounded; beaks 3 to 20 mm. long; awns 3 to 7 cm. long; kernels white, short, soft, broadly ovate to oval; germ midsized; crease midwide, shallow; cheeks usually rounded; brush midsized, midlong.

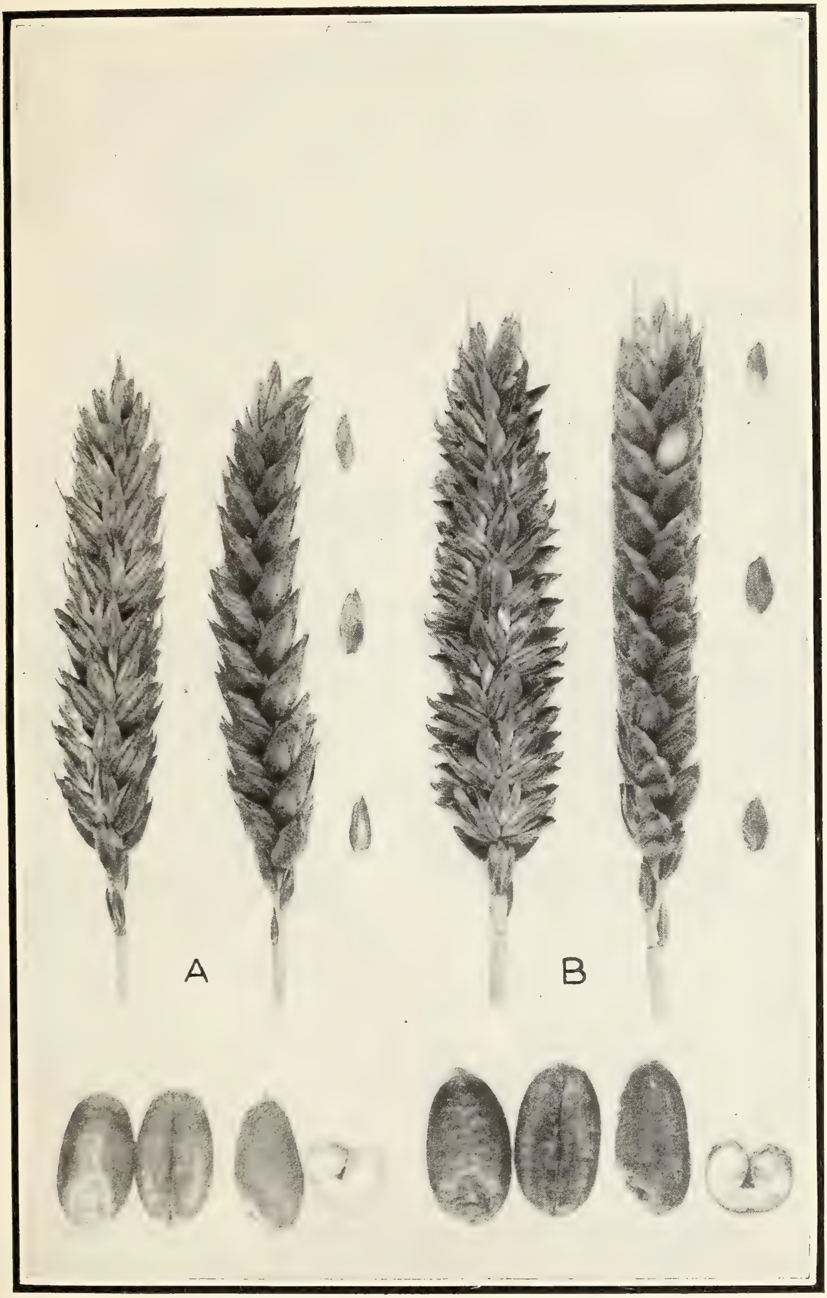
Seneca Chief, as described above, differs from Oatka Chief in being shorter and in having a shorter and denser spike, longer beaks, and smaller kernels.

History.—The origin of Seneca Chief is not determined. It was reported by Carleton in 1900 as a wheat of American origin (*58*, p. 54). It was listed by the Ohio Agricultural Experiment Station for the first time in 1888 (*81*, p. 29), but at that time was described as an awned, brown-glumed, red-kerneled variety similar to Diehl-Mediterranean. This may be the correct description for Seneca Chief, and the variety grown by the writers may possibly be the old Diehl wheat which is known to have been of this type.

Distribution.—Seneca Chief as described above was formerly grown in New York, but is not now known to be grown commercially. It is being grown at several experiment stations.

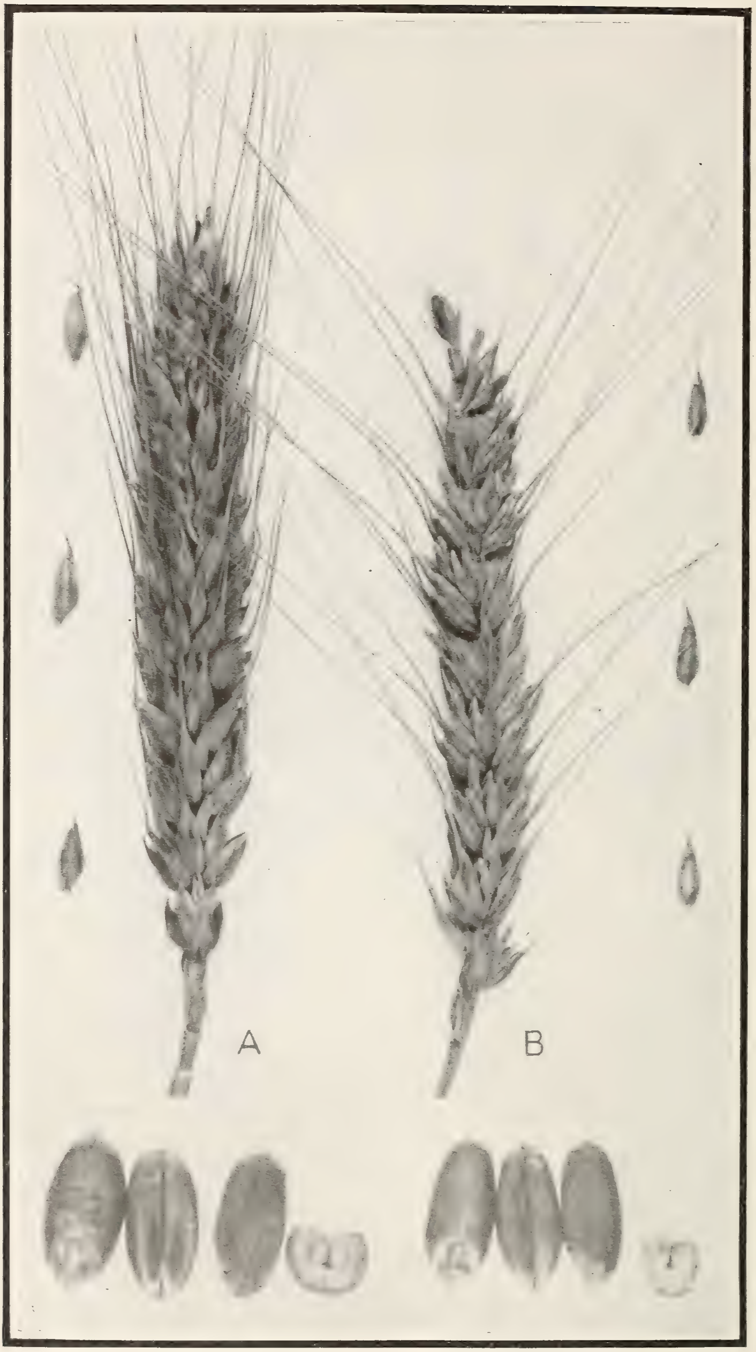
OATKA CHIEF.

Description.—Plant winter habit, late, midtall; stem white, strong, stout; spike awned, linear-clavate, inclined; glumes glabrous, white, midlong, midwide; shoulders narrow, usually rounded; beaks 2 to 10 mm. long; awns 3 to 6 cm. long; kernels white, short to midlong, soft, ovate to elliptical; germ midsized; crease midwide, middeep; cheeks usually rounded; brush midsized, midlong.



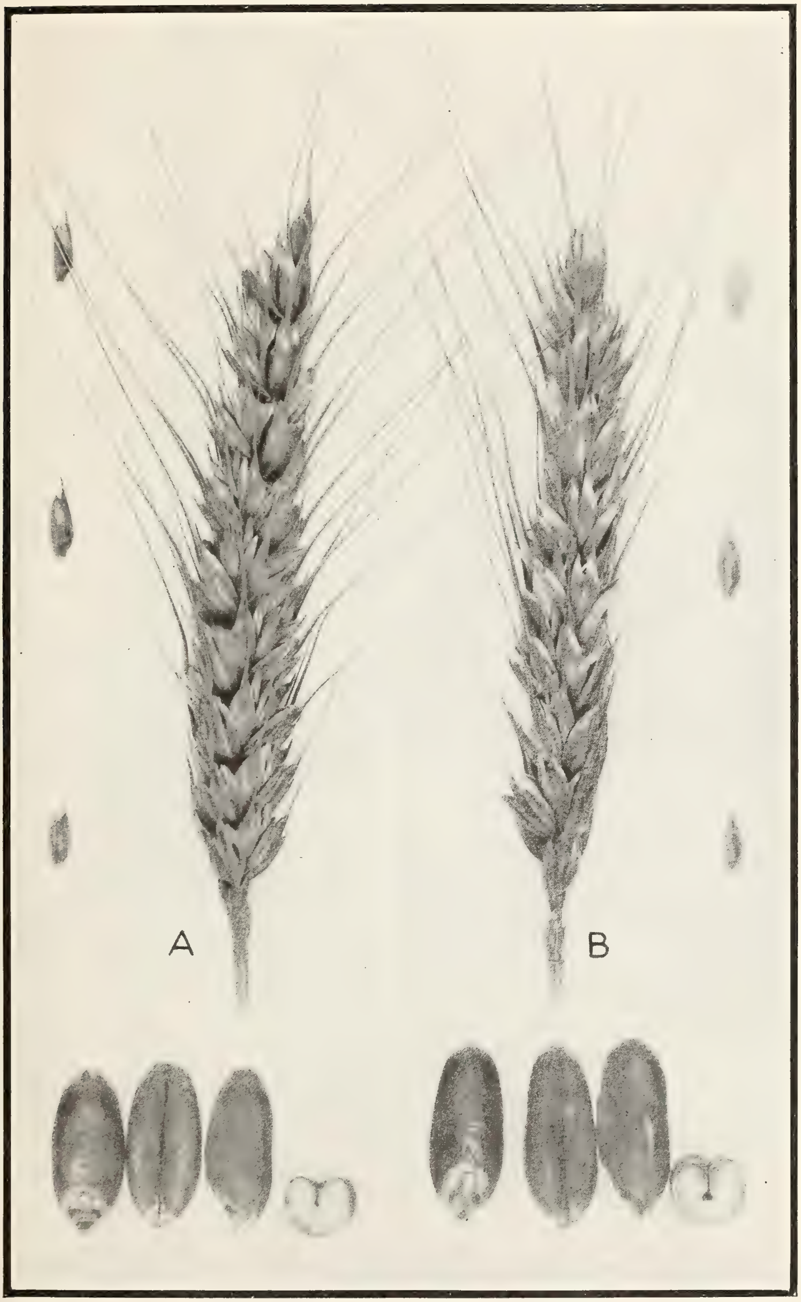
SONORA (A). GRANDPRIZE (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



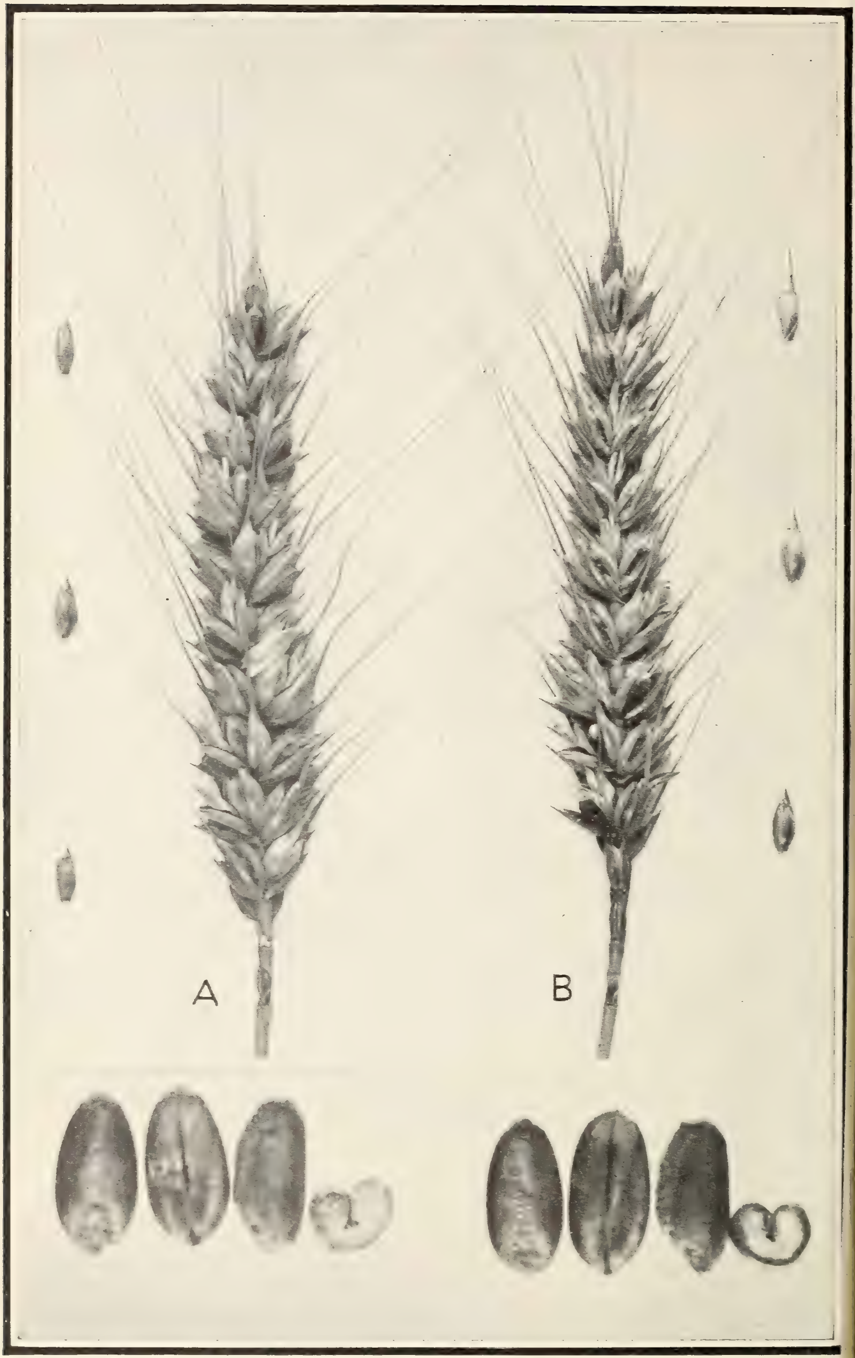
OATKA CHIEF (A). PALISADE (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



PROPO (A). BAART (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



GIPSY (A). VALLEY (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

A spike, glumes, and kernels of Oatka Chief are shown in Plate XXXV, *A*.

History.—Oatka Chief was originated by A. N. Jones, of Newark, Wayne County, N. Y., in 1896.[19]

It was distributed by Henderson (*110*, p. 73) in 1897. In 1905 it was listed by the Ohio Agricultural Experiment Station as a red-kerneled wheat (*204*, p. 38). This was evidently an error, however, or else this station had a different wheat.

Distribution.—This variety probably now has disappeared from commercial cultivation. It is still grown at several of the eastern experiment stations.

MAMMOTH AMBER (JONES MAMMOTH AMBER).

Description.—Plant winter habit, late, midtall; stem purple, strong, stout; spike awned, clavate, middense to dense, erect to inclined; glumes glabrous, white, midlong, midwide; shoulders narrow, usually oblique; beaks 2 to 15 mm. long; awns 3 to 6 cm. long; kernels white, midlong, soft, ovate; germ midsized; crease narrow to midwide, shallow to middeep; cheeks usually rounded; brush midsized, midlong.

This variety differs from the Seneca Chief and Oatka Chief principally in having purple stems.

History.—This variety also was originated by A. N. Jones (*127*). He has recorded its history as follows:

> This fine variety of wheat originated from crossbreeding my American Bronze, known in many sections as No. 8 (its trial-bed number). This cross was crossbred with Early Genesee Giant.

Jones Mammoth Amber was advertised and distributed by Peter Henderson & Co. in 1906.

Distribution.—This wheat is not known to be commercially grown at the present time.

PALISADE (WHITE PALISADE).

Description.—Plant spring habit, midseason, midtall; stem white, weak, slender; spike awned, fusiform, middense, inclined to nodding; glumes glabrous, white, midlong, narrow; shoulders wanting to narrow, oblique; beaks 2 to 4 mm. long; awns 3 to 7 cm. long; kernels white, midlong, soft, ovate to elliptical; germ small; crease narrow to midwide, shallow; cheeks rounded to angular; brush midsized, short.

A spike, glumes, and kernels of Palisade are shown in Plate XXXV, *B*.

History.—White Palisade wheat was obtained by the North Platte substation, North Platte, Nebr., from a farmer in the vicinity of Palisade, Nebr., about 1907. The previous history of the variety is undetermined. The White Oregon variety, which appears to be synonymous, was grown in the central part of the United States many years ago.

Distribution.—Grown under the names of synonyms in Colorado, Nebraska, and western Kansas.

Synonyms.—White Oregon and White Spring. Samples of White Oregon were obtained in Logan and Rawlins Counties, Kans., in 1919. The variety was reported in several other counties in Kansas as well. White Spring is a descriptive name for the Palisade variety used by many growers in Kansas and Nebraska.

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[19] Printed stationery of Mr. Jones.

PROPO.

Description.—Plant spring habit, early to midseason, midtall; stem faintly purple, midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to square; beaks 2 to 5 mm. long; awns 3 to 7 cm. long; kernels white, midlong, soft, ovate to elliptical, slightly humped; germ small to midsized; crease midwide, middeep; cheeks rounded to angular; brush midsized, midlong.

Propo is distinct from the other wheats in the group in having a straw which is faintly purple. A spike, glumes, and kernels of this variety are shown in Plate XXXVI, A.

History.—This variety was first known as Proper, for which the following history was recorded in 1879 (*156*):

> The Proper originated from the selection of a number of heads of bearded wheat in a field of Mr. Proper, at Sutter station, on the line of the Marysville & Vallejo Railroad, in Sutter County. Impressed with their appearance, Mr. Proper gathered and sowed, and sold to his neighbors, a very fine article of early wheat, eagerly sought after by millers, and which makes a superior article of flour. The Proper is a bearded wheat and exactly similar in appearance, as to the heads, to the Pride of Butte, although of entirely a different nature. . . . The Proper is a wheat which ripens very early—as early as the Sonora, one of the earliest known varieties. It is from five to eight days later, owing to peculiarities of soil in this respect. It is not a very good wheat to stool, and in this respect quite unlike the Pride of Butte. It is of rather soft straw, and in rich ground is liable to fall down and lodge, hence on such land it is better to sow in the spring, but not on poor land. It will stand later sowing and still mature earlier than any other variety I know of except Sonora (*156*).

The writers believe the above history is the true origin of the variety. The following later and somewhat different history of Propo also has been recorded by Shaw and Gaumnitz (*176*, p. 318), of the California Agricultural Experiment Station:

> Of Propo, Mr. R. M. Shackleford, of Paso Robles, for many years connected with the milling trade of this State, is authority for the statement that this variety was a field selection from a sowing made from a shipment of wheat from Chile, the selection being sufficient in quantity to seed 30 acres of land in the Panoche Valley. From this 30 acres there was produced about 500 sacks of wheat. Mr. Shackleford writes:
>
> "I purchased this wheat and shipped it to Mr. A. D. Starr, of Marysville. The name given to this wheat at the time I purchased it was 'Snowflake,' and I shipped it to him under that name. There was some little seed left in the country, and quite an inquiry arose for the same seed. Mr. Starr returned me two carloads—one in the Salinas Valley and one to Hollister. He reported to me the proper name was Propo. My memory is that was the name that was given to it at the time I purchased it, but old settlers tell me it was called 'Snowflake,' and that until it was returned from the north it was not known as 'Propo.' This leads me to believe that some of the original seed was distributed in the north and raised much as it was in San Benito County, and that it received the name Propo or Proper from the party who there grew it. My opinion is that this is a complete history of the introduction of Propo wheat into California."

Distribution.—Grown in Colusa, Monterey, Riverside, San Luis Obispo, Santa Barbara, and Sutter Counties, Calif.

Synonym.—Proper. This probably is the original name for the variety, but in recent years the name Propo has become most generally used.

TREADWELL.

Description.—Plant winter habit, midseason, tall; stem white, midstrong; spike awned, fusiform, middense, nodding; glumes glabrous, white, long, midwide, easily deciduous; shoulders wanting to narrow, oblique; beaks 3 to 15 mm. long; awns 3 to 7 cm. long; kernels white, long, soft, elliptical, acute; germ small to midsized; crease narrow, shallow; cheeks usually rounded; brush small, usually long.

The above description is for only one of several strains of Treadwell wheat.

History.—Treadwell wheat was recorded in the Rural New Yorker in 1868 as having originated "in Michigan and is probably a hybrid." Several other early references refer to Treadwell wheat as a mixed variety. An awnless white-kerneled strain and an awned red-kerneled strain had been developed from it as early as 1882. The awnless white-kerneled strain was known as Smooth Treadwell and the awned red-kerneled strain as Bearded Treadwell (*81*, p. 27). The original wheat is thought to have been mostly of the type described above.

Distribution.—Reported in 1919 from Oakland and Tuscola Counties, Mich. In Tuscola County it was described as above, while in Oakland County it was reported to be an awnless wheat, having white kernels.

BAART (EARLY BAART).

Description.—Plant spring habit, early, midtall to tall; stem white, midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, white, long, narrow; shoulders narrow, oblique to square; beaks 3 to 5 mm. long; awns 3 to 6 cm. long; kernels white, long, soft to semihard, ovate to obpyriform; germ small; crease narrow, shallow; cheeks usually rounded; brush midsized, short to midlong.

This variety can be distinguished from all others by the yellowish pear-shaped kernels. A spike, glumes, and kernels of Baart wheat are shown in Plate XXXVI, *B*.

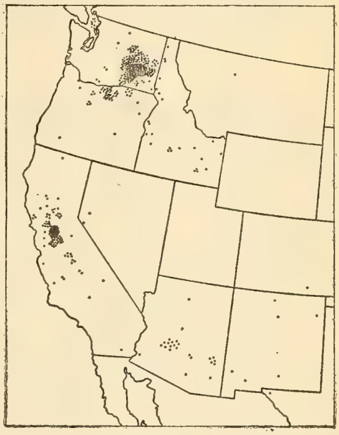

FIG. 52.—Outline map of the western United States, showing the distribution of Baart wheat in 1919. Estimated area, 500,500 acres.

History.—The Early Baart was received with four other varieties (*197*, S. P. I. No. 5078) from Australia by the United States Department of Agriculture in 1900. The commercial distribution of the variety in this country certainly is the result of this introduction. In Australia it has never been a leading commercial variety, although it has been grown by some farmers for many years. In recent introductions of wheat from South Africa varieties have been obtained which are identical with Early Baart. The name "Baart" is Dutch for bearded. It seems probable that the variety was introduced to Australia from the Orange River Colony or the Transvaal in South Africa and was originally of European origin (*67*, p. 3).

The variety probably was first distributed for commercial growing by the Arizona Agricultural Experiment Station, which obtained its original seed from the Office of Cereal Investigations, United States Department of Agriculture. The variety was well established in Arizona by 1914, when it was first grown in Washington, and later spread to Oregon, Idaho, and California.

Distribution.—Grown in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, and Washington. (Fig. 52.)

Synonyms.—Arizona Baart, Columbia, Diener Hybrids, Diener No. 18, and White Columbia. Arizona Baart is a name often used for the variety, because it first became commercially established in Arizona. Columbia and White Columbia are local names used for Early Baart wheat in the vicinity of Fair-field and Spangle, Wash. Diener Hybrids and Diener No. 18 are names under which Baart wheat was distributed by the Richard Diener Co., Kentfield, Calif. The so-called Diener Hybrids were first distributed in the fall of 1918. There were three similar strains known as Nos. 2, 16, and 18. Concerning Diener No. 18, Mr. Diener has written as follows:[20]

> This No. 18 was produced as follows: The original 50 berries were picked out of chicken feed and planted, but when the plants came up they showed no unusual qualities, being just common ordinary wheat. These 50 berries had been planted about 20 inches apart in the rows and the rows about 20 inches apart. About 30 plants lived and from the natural pollinization back and forth between these 30 plants the hybridization resulted. The important features of my process lie in the selection of the original 50 berries.

TALIMKA.

Description.—Plant spring habit, early, short; stem white, slender, weak; spike awned, fusiform, middense to lax, inclined; glumes glabrous, white, midlong, midwide, firm; shoulders narrow to midwide, oblique to apiculate; beaks 5 to 40 mm. long; awns 2 to 5 cm. long; kernels white, long, hard, ovate, slightly humped; germ small; crease midwide, shallow; cheeks angular; brush usually small, short.

This variety differs from Chul only in having white kernels. The kernels are large, hard, corneous, and greatly resemble those of durum wheats, except that the brush is longer.

History.—Talimka wheat was introduced from Russian Turkestan by the United States Department of Agriculture in 1904 (*197*, S. P. I. No. 10611) and also as a mixture in introductions of Chul. The name Talimka was not a part of the record of the introduction above cited, but was applied to the wheat about 1916, as it was identical with a later introduction from Russia which bore that name (C. I. No. 3717). A still later introduction under the name of Talimka was obtained from Russia (C. I. No. 5016), but this wheat proved to be similar to Ghirka.

Distribution.—Talimka wheat is grown at experiment stations in the Pacific coast areas, but not commercially except as a mixture in Chul.

Synonym.—Saumur. This variety is identical with Talimka. It was introduced by the United States Department of Agriculture in 1903 from France, where it has been grown for many years.

NEBRASKA NO. 28.

Description.—Plant winter habit, early, short; stem white, midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide, easily deciduous; shoulders narrow to midwide, oblique to square; beaks 2 to 5 mm. long; awns 2 to 5 cm. long; kernels red, short to midlong, soft to semihard, ovate, slightly humped; germ small; crease narrow to midwide, shallow; cheeks rounded; brush midsized, midlong.

Nebraska No. 28 resembles Turkey somewhat, but usually is about 6 inches shorter, ripens from 7 to 10 days earlier, has softer kernels, and shatters more easily.

History.—This wheat is the result of a cross between Big Frame and Turkey, made in 1902 by either T. L. Lyon or Alvin Kezer at the Nebraska Agricultural Experiment Station. The Turkey variety was probably the male parent. Number 28 is a selection from the progeny made by Montgomery, which was later further selected and thoroughly tested by Kiesselbach.

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[20] Correspondence with the Office of Cereal Investigations, dated Aug. 28, 1918.

Distribution.—This strain was distributed in 1916 by the Nebraska Agricultural Experiment Station for testing at other stations and for commercial growing in Nebraska. It is now grown by a number of experiment stations in the United States, and doubtless to some extent by farmers in Nebraska. None of this variety was reported in the survey of 1919.

Synonym.—Nebraska Hybrid is the name used by several experiment stations where the variety is grown.

GLADDEN.

Description.—Gladden is similar to Gipsy, but can be distinguished from it by its shorter beaks, which usually do not exceed 3 mm. It also has stronger stems and is superior to Gipsy in yield and quality.

History.—The following history of the Gladden wheat has been reported by Prof. C. G. Williams (*206*), of the Ohio Agricultural Experiment Station, where the variety originated:

> The Gladden wheat originated from a single head of wheat selected from a field of Gipsy wheat in 1905, and was first grown in 1906 under the number 6100, along with other head rows of Gipsy, Fultz, Poole, and other varieties. It has many of the characteristics of the Gipsy wheat, being bearded, having a white chaff and red kernel.
>
> In consulting the old notebooks of 14 years ago I find it described as "very erect" in growth, the words being underscored, and given the highest rank for stiffness of straw of any of the Gipsy rows, and as high a rank as any row in the test. The photographs taken in 1907, 1910, and 1915 show more than ordinary stiffness of straw.
>
> In so far as yield is concerned, it had to stand high from the start or be cast aside. A vast majority of the heads tested were weeded out each year on account of ordinary yield. In milling and baking tests in 1915 the Gladden showed superior qualities.
>
> This variety passed along under the number name, 6100, until 1915, when it seemed best to give it a real name in order to prevent confusion, as it was being distributed quite a little over the State. It was named for Washington Gladden, a man not associated with agriculture particularly, but the most useful citizen Ohio had for many years.

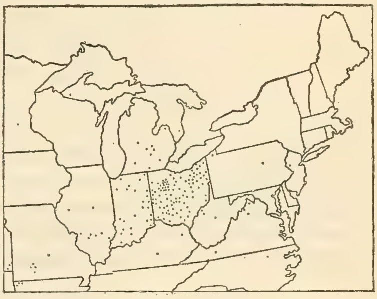

FIG. 53.—Outline map of the northeastern United States, showing the distribution of Gipsy wheat in 1919. Estimated area, 122,500 acres.

Distribution.—Grown in many parts of Ohio.

GIPSY.

Description.—Plant winter habit, midseason, midtall; stem white, midstrong; spikes awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to square; beaks 2 to 10 mm. long; awns 3 to 7 cm. long; kernels red, midlong, soft to semihard, ovate, humped; germ midsized; crease midwide, shallow to middeep, pitted; cheeks usually rounded; brush small, midlong.

A spike, glumes, and kernels of Gipsy wheat are shown in Plate XXXVII, *A*.

History.—The origin of Gipsy wheat is undetermined. It was grown in Missouri as early as 1877 (*14*) and at the Ohio Agricultural Experiment Station by 1888 (*81*, p. 28). There is a tradition that the name was given the variety because it was first obtained from a gipsy.

Distribution.—Grown in Arkansas, Delaware, Illinois, Indiana, Kansas, Kentucky, Michigan, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, and West Virginia. (Fig. 53.)

Synonyms.—Defiance, Egyptian, Farmers Friend, Golden Straw, Grains o'Gold, Gipsy Queen, Lebanon, Niagara, and Reliable.

Defiance is the name under which a wheat practically identical with Gipsy was obtained from the Missouri Agricultural Experiment Station in 1913. It is probable that this name became wrongly applied to this wheat, as the writers are not able to find any other record of such application. Egyptian is a name frequently used by farmers for the Gipsy variety. Farmers Friend is the name which has been applied to Gipsy wheat, as well as several other varieties. A sample of Farmers Friend obtained from the Wisconsin station in 1917 as Wisconsin No. 55 proved to be a mixture of Gipsy and Fulcaster. Golden Straw is the name used for a sample of Gipsy wheat obtained from Kansas in 1919. Grains o'Gold is a name applied to a mixed lot of wheat by the J. A. Everitt Seed Co. (O. K. Seed Store), Indianapolis, Ind., and distributed about 1912. They stated it was originated by E. K. Adams, of Allendale, Ill.[21] Our samples of this wheat contained a considerable proportion of Gipsy with admixtures of Fulcaster, Fultz, and Fultzo-Mediterranean. It was reported in 1919 from Kentucky, Missouri, Ohio, Tennessee, and West Virginia.

Gipsy Queen is a name used for Gipsy in Indiana. Lebanon is a wheat similar to Gipsy, though it appears to have a slightly harder kernel. Its origin is undetermined. It has been grown by the Ohio Agricultural Experiment Station since about 1893 (*204*, p. 39). The name Lebanon is used for other varieties of wheat, one of which is identical with Mediterranean and another is very similar to Mammoth Amber. Niagara is the name under which a sample of Gipsy was obtained from Hudsonville, Mich., in 1919. Reliable is a wheat of undetermined origin, practically identical with Gipsy. It was grown by the Ohio Agricultural Experiment Station as early as 1888 (*81*, p. 29). It was reported in 1919 from Michigan and Pennsylvania.

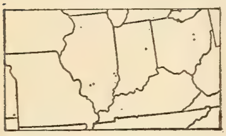

FIG. 54.—Outline map of a portion of the central United States, showing the distribution of Valley wheat in 1919. Estimated area, 5,200 acres.

VALLEY.

Description.—Valley differs from Gipsy only in being taller, slightly earlier, and having slightly longer spikes and glumes. Photographs of a spike, glumes, and kernels of Valley are shown in Plate XXXVII, *B*.

History.—Valley was obtained by the Ohio station from Elias Tetter, Pleasant Plain, Ohio, in 1883, and grown by them for the first time in 1884 (*81*, p. 35). It is "said to have originated in the Scioto Valley, Ohio" (*114*, p. 3).

Distribution.—Grown in Illinois, Indiana, and Ohio, and under synonyms in Kansas and Texas. This distribution is shown in Figure 54.

Synonyms.—German Amber, Indiana Swamp, Niagara, Russian Amber, and Rust Proof.

German Amber is a name used for Valley in Cherokee County, Kans. Indiana Swamp is a name under which a sample of wheat very similar to Valley was obtained from the Illinois station in 1913. A wheat under that name was grown by them as early as 1902. The Everitt O. K. Seed Store advertised Indiana Swamp wheat in 1899, stating that it was of the Mediterranean type. The name Swamp is also used for several other varieties. Indiana Swamp was reported in 1919 from Indiana, Ohio, and West Virginia, but most of the wheat so reported evidently was Mediterranean. Niagara is the name of a wheat obtained from the Missouri Agricultural Experiment Station in 1913, which is similar to Valley, except that it has slightly shorter beaks. Its origin is undetermined. A sample of the Niagara variety obtained from Michigan, where the variety was reported, proved to be identical with Gipsy. Niagara is used also as a synonym for Goldcoin in Michigan. Russian Amber is the name under which a sample of wheat was obtained from the Indiana station in 1913. Its previous history is not known. It differs from Valley only in having shorter beaks, as does Niagara. It is not known to be commercially grown. Rust Proof is the name given to a lot of wheat which was obtained in 1919 from Ernest Klappenbach, of Johnson City, Tex., who stated it to be "a rust-resistant strain of wheat developed by continued grading for a series of years." The variety is very similar in many respects to Valley, but is not pure for the straw-color character.

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[21] Correspondence with the Office of Cereal Investigations, dated Sept. 26, 1912.

WISCONSIN PEDIGREE NO. 40.

Description.—This variety is similar to Valley except that it is slightly taller.

History.—This is a pure line developed at the Wisconsin Agricultural Experiment Station. The writers obtained their sample in 1917.

Distribution.—Wisconsin Pedigree No. 40 is not known to be commercially grown, as it was not reported in the varietal survey.

SIBLEY (SIBLEY'S NEW GOLDEN).

Description.—Plant winter habit, midseason to late, short to midtall; stem white, slender, weak; spike awned, fusiform, middense, inclined; glumes glabrous, white to yellowish, midlong, narrow; shoulders narrow, oblique to square; beaks 2 to 10 mm. long; awns 3 to 6 cm. long; kernels red, midlong, soft, ovate; germ small; crease narrow, middeep; cheeks rounded; brush small, midlong.

Sibley differs from Gipsy and Valley chiefly in being shorter and later. Other types bearing the name Sibley's New Golden have been observed, one of which has brown glumes and another which has white glumes, purple straw, and large kernels.

History.—"Sibley's New Golden is a light-bearded amber wheat, obtained by crossing the Mediterranean and Clawson" (*57*, p. 19). It was distributed by the United States Department of Agriculture during the late eighties.

Distribution.—This wheat was formerly cultivated in the Ohio Valley, but now has largely disappeared from cultivation. The variety as above described was reported from Payne County, Okla., in 1919.

FULCASTER.

Description.—Plant winter habit, midseason, midtall; stem purple, strong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide to wide; shoulders midwide, oblique to square; beaks 2 to 8 mm. long; awns 3 to 6 cm. long; kernels red, midlong, soft, ovate, humped; germ midsized; crease midwide, middeep, sometimes pitted; cheeks usually angular; brush midsized, midlong.

Fulcaster differs from Gipsy and Valley in having purple straw and shorter beaks. A prominent characteristic is the orange-colored stripes on the glumes. It is one of the most popular and widely grown varieties of soft red winter wheat in the United States. A spike, glumes, and kernels of this variety are shown in Plate XXXVIII, *A*.

History.—According to Carleton (*58*, p. 70), "Fulcaster was produced in 1886 by S. M. Schindel, of Hagerstown, Md., and is a hybrid between Fultz and Lancaster," the latter being the Mediterranean variety.

Distribution.—Grown as Fulcaster or under one of the many synonyms, in Alabama, Arkansas, Delaware, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, and West Virginia. (Fig. 55.)

Synonyms.—Acme, Acme Bred, Bearded Bluestem, Bearded Purplestraw, Blankenship, Blue Ridge, Bluestem, Canadian, Champion, Corn, Cumberland Valley, Dietz, Dietz Longberry, Dietz Longberry Red, Ebersole, Eversole, Egyptian Amber, Farmers Friend, Georgia Red, Golden Chaff, Golden King, Greening, Improved Acme, Ironclad, Kansas Mortgage Lifter, Kentucky Giant, Lancaster, Lancaster-Fulcaster, Lincoln, Martha Washington, Michigan Red Line, Moore's Prolific, Number 10, Price's Wonder, Red Wonder, Stoner (Eden, Famine, Forty-to-One, Half Bushel, Kentucky Wonder, Marvelous, Millennium, Millennium Dawn, Miracle, Multiplier, Multiplying, New Light, New Marvel or Goose, Peck, Russellite, Russell's Wonder, Stooling, Two Peck, Three Peck, Wonderful), Turkish Amber, Tuscan Island, and Winter King.

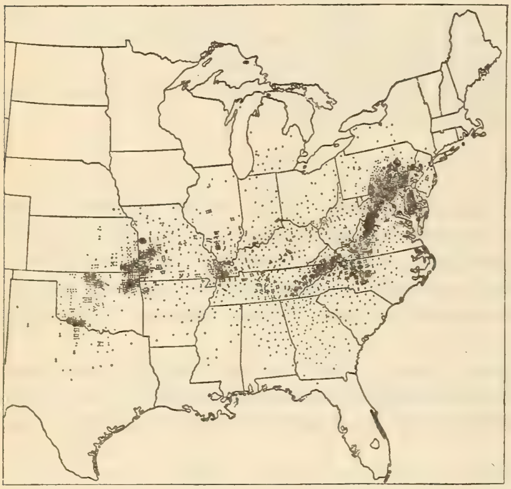
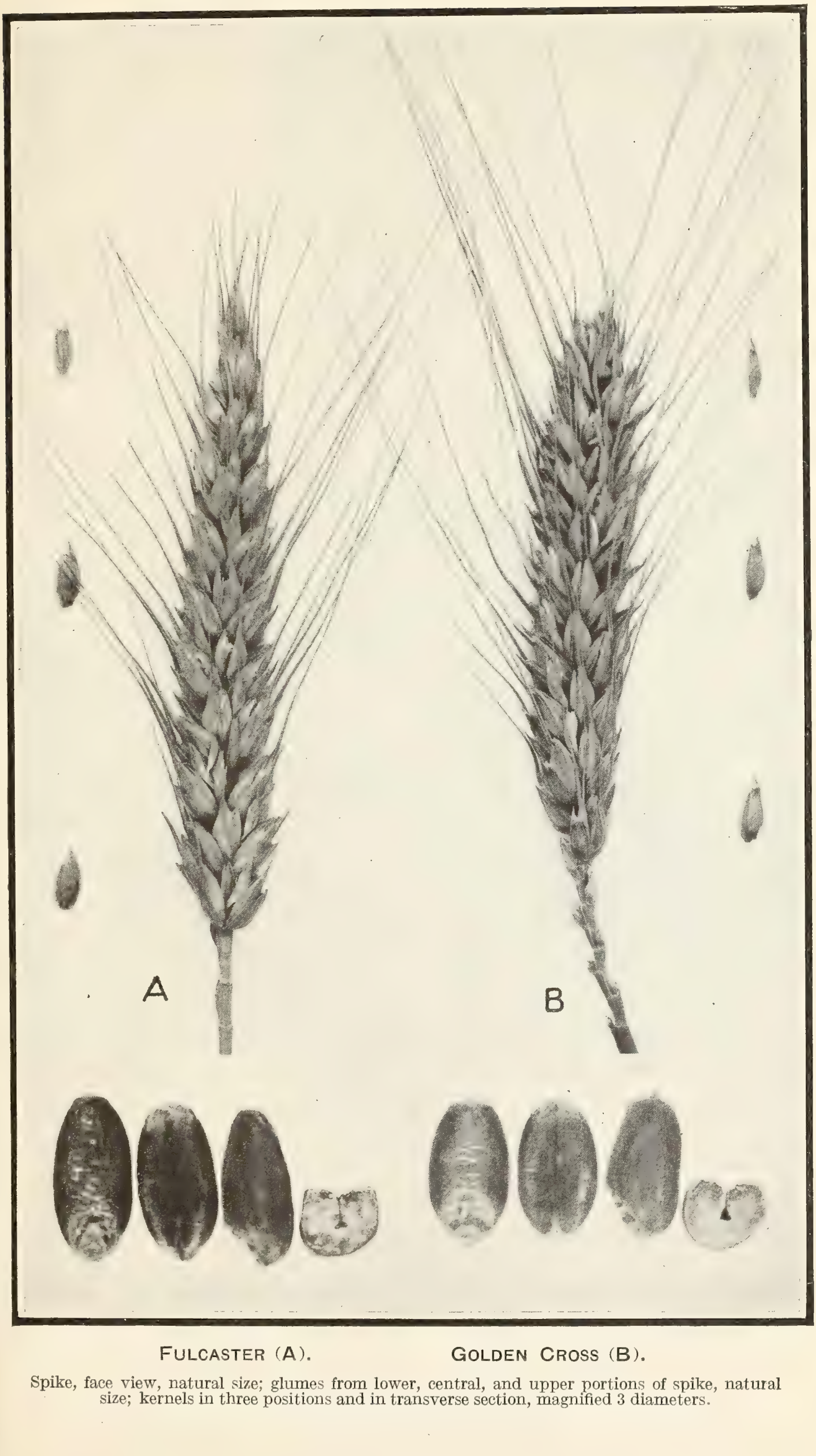


FIG. 55.—Outline map of the eastern United States, showing the distribution of Fulcaster wheat in 1919. Estimated area, 2,576,500 acres.

Acme and Acme Bred were names applied to strains of Fulcaster by S. M. Schindel, seedsman, of Hagerstown, Md., about 1911. The name Improved Acme is now used also for this variety in Maryland. Bearded Bluestem, Bluestem, and Bearded Purplestraw are names used for Fulcaster because the variety has purple stems. Bearded Purplestraw was first obtained by the Office of Cereal Investigations from Tuscumbia, Ala., in 1899. Blankenship is the name under which a sample of Fulcaster was obtained in 1919 from Stella, Mo., where it had been grown for many years. The report stated that the variety was "very hardy, almost fly proof, branches well, and lays close to ground in winter." Blue Ridge is the name of a wheat practically identical with Fulcaster, which was first obtained from the Kentucky station in 1913. Blue Ridge was reported in 1919 from North Carolina, New Jersey, and Pennsylvania. Canadian is the name under which a sample of Fulcaster was obtained from Dyer, Tenn. It was reported grown in Ohio, Pennsylvania, Tennessee, and Virginia. Champion is the name used for Fulcaster wheat in Genesee County, Michigan. Corn is the name used for a sample of Fulcaster wheat obtained from Cumberland Valley, Pa. Corn wheat, however, usually refers to Polish wheat. Cumberland Valley is a local name used for Fulcaster in Clinton County, Ohio, during the past 10 years.

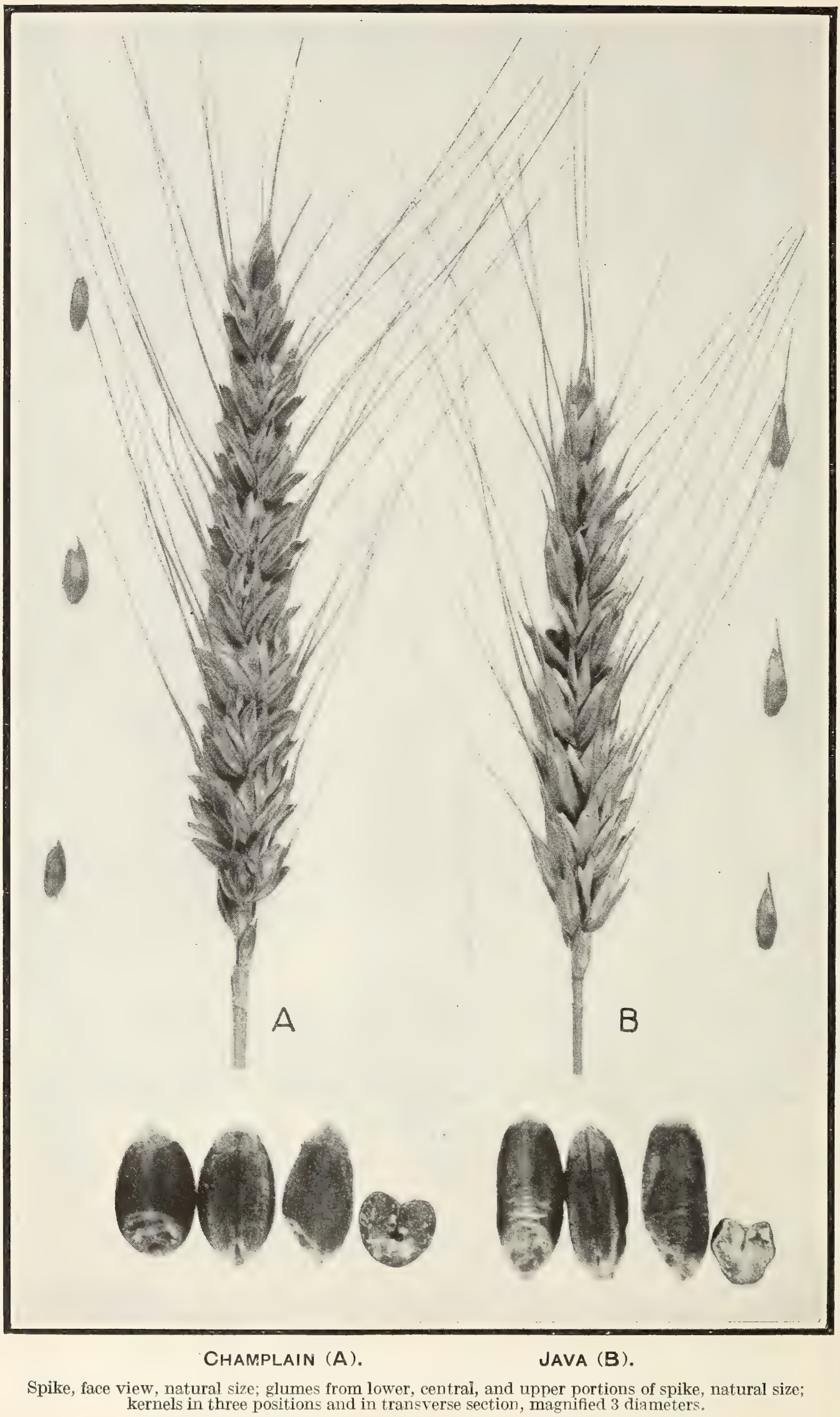
Dietz, Dietz Longberry, and Dietz Longberry Red are apparently the same variety and morphologically identical with Fulcaster.

Dietz Longberry is reported to have been originated by George A. Dietz, of Chambersburg, Pa. (*80*, p. 17).



FULCASTER (A). GOLDEN CROSS (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



CHAMPLAIN (A). JAVA (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

The earliest record of this wheat is simply under the name "Dietz." It was first included in the varietal experiments of the Ohio station in 1884. The same wheat, however, apparently soon came to be called Dietz Longberry (*22*, p. 591), and was later known as Dietz Longberry Red (*57*, p. 18). The true origin of Dietz Longberry and Fulcaster is somewhat obscure. The former has the earlier published history. However, according to N. Schmitz, formerly of the Maryland Agricultural Experiment Station, Mr. Schindel claimed that Mr. Dietz merely gave the name Dietz Longberry to his Fulcaster wheat. Dietz or Dietz Longberry was reported in 1919 from Delaware, Illinois, Indiana, Kentucky, Maryland, New Jersey, New York, North Carolina, Pennsylvania, Tennessee, and Virginia. Some of the wheat reported as Dietz evidently was Mediterranean, as the name Dietz-Mediterranean is a synonym for that variety.

Ebersole and Eversole are names used for Fulcaster in Pennsylvania and Tennessee. Egyptian Amber is the name of a wheat very similar to Fulcaster obtained by the Department from the Indiana station through the Cornell University station in 1912. It was reported in 1919 from Indiana. Farmers Friend is the name used for Fulcaster in Montgomery County, Kans. This name also is used for other varieties. Georgia Red is the name under which Fulcaster wheat has been distributed by H. G. Hastings & Co., seedsmen, of Atlanta, Ga. The name Georgia Red is used in the South also for the awnless wheat Purplestraw. Golden Chaff is the name under which a sample of Fulcaster was obtained from Bethelridge, Ky. Golden King is the name under which a sample of Fulcaster was obtained from Pennsylvania. Greening is a local name used for Fulcaster in Michigan. Ironclad is a name sometimes applied to Fulcaster, although it is most commonly used as a synonym for the Gipsy or Turkey varieties.

Kentucky Giant is a local name for Fulcaster in Illinois. Lancaster is a name often wrongly applied to Fulcaster wheat. It was reported in 1919 from 14 States, but only occasionally under the same description as Fulcaster. Lancaster-Fulcaster is a name of Pennsylvania origin applied by A. H. Hoffman, seedsman, of Landisville, Pa., to Fulcaster wheat grown in Lancaster County, Pa. All the samples of wheat obtained under this name have been Fulcaster. Lincoln is a name used for Fulcaster wheat in Tennessee. Martha Washington is a local name for Fulcaster in Michigan. Michigan Red Line is the name under which a sample of Fulcaster was obtained from Golden City, Mo. Moore's Prolific is the name under which the Fulcaster wheat was obtained from Athens, Tenn. Number 10 is a name used for Fulcaster in Kentucky. Price's Wonder is the name of a wheat identical with Fulcaster, which was distributed for the first time in 1913 by A. H. Hoffman, seedsman, of Landisville, Pa., who gives its origin as follows (*117*, p. 10, 1916):

> Price's Wonder was originated by Prof. R. H. Price, of Virginia, who worked with it five years, during which it yielded one-third more wheat than other kinds of wheat growing near it under like conditions.

Price's Wonder was reported in 1919 from New Jersey, New York, and Pennsylvania. Red Wonder is the name under which Fulcaster wheat has been distributed by T. W. Wood & Sons, seedsmen, of Richmond, Va., since about 1903. The name, however, was recorded for a wheat of unknown character as early as 1892 (*177*). Red Wonder was reported in 1919 from Connecticut, Iowa, Kentucky, Maryland, North Carolina, Oklahoma, Tennessee, Texas, Virginia, and West Virginia, and doubtless is grown in other States.

Stoner can not be distinguished from Fulcaster by any character and is here considered merely a strain of that variety. The history of Stoner has been recorded by Ball and Leighty as follows (*44*, p. 15):

> Stoner originated on the farm of Mr. K. B. Stoner, of Fincastle, near Roanoke, Va. It was first brought to the attention of the United States Department of Agriculture through a letter from Mr. Stoner, dated June 8, 1906. In the spring of 1904 Mr. Stoner noticed a large bunch of grass in his garden; when headed it proved to be wheat. It had 142 stems, or tillers, and he became impressed with the idea that it was a very wonderful wheat. Just how the kernel of wheat became sown in the garden or from just what variety it came Mr. Stoner does not know. The Fulcaster variety is commonly grown in that section of Virginia, however, and the Bearded Purplestraw less commonly. It is reasonable to suppose, therefore, that the Stoner wheat is a pure line from one of these varieties, which it so closely resembles.

Mr. Stoner increased his seed during the two years, 1905 and 1906, and distributed it in 1907, usually under the name "Miracle." Many extravagant claims were made for it by Mr. Stoner and agents who handled the seed. Because of these claims it afterwards became known under many other names. During 1911 and 1912 the variety was advertised and sold at $1 a pound by the Watch Tower Bible and Tract Society of Brooklyn, N. Y., under the leadership of "Pastor" Russell. The names Eden, Famine, Millennium, Millennium Dawn, New Light, Russellite, and Russell's Wonder are the result of the advertising and distribution by "Pastor" Russell, who claimed the wheat to be a creation in fulfillment of Biblical prophecy which would replenish the earth. The name Eden was used to imply that the wheat came from the Garden of Eden. Forty-to-One is the name which became applied to Stoner wheat, with the inference that that was the ratio of its increase from the seed sown. The names Half Bushel, Multiplier, Multiplying, Peck, Stooling, Two Peck, and Three Peck became widely applied to the Stoner variety on account of the claims made by Mr. Stoner that the wheat had such remarkable tillering or stooling powers that only a small quantity of seed was necessary to sow an acre. Kentucky Wonder is a name used for Stoner in Indiana. Marvelous is a name which was used for Stoner wheat by J. A. Everitt (O. K. Seed Co.), Indianapolis, Ind., in 1908 and later. The wheat was widely distributed under that name. Miracle, as shown above, is the name under which K. B. Stoner, of Fincastle, Va., first distributed his variety. It was under this name that some very extravagant claims were made for it, which accounts in part for the number of names which since have been applied to it. New Marvel or Goose are names under which the variety was obtained in the vicinity of Salem, Oreg. Wonderful is a name used for Stoner in Kansas.

Stoner, or the names recorded after it in parentheses, was reported in 1919 from Alabama, Arkansas, Delaware, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

Turkish Amber is the name of a wheat similar to Fulcaster, samples of which have been obtained from the Pennsylvania Agricultural Experiment Station. The name appears to have come into use about 1912. Winter King is the name used for a sample of Fulcaster obtained from Table Rock, Pa. This name is applied also to the Goldcoin and Poole varieties.

MAMMOTH RED.

Description.—Mammoth Red is practically identical with Fulcaster, except for being slightly later and shorter and in having a slightly larger and harder kernel.

History.—This variety was first obtained by the United States Department of Agriculture in 1904 from the 101 Ranch, Bliss, Okla. The wheat was distributed by the David Hardie Seed Co., Dallas, Tex., in the early nineties. In experiments at the Maryland Agricultural College, College Park, Md., it is the highest yielding of the many varieties tested at that point, and has been distributed from that station and from Arlington Experimental Farm, Va.

Distribution.—Grown in Indiana, Maryland, Michigan, Missouri, and Virginia.

DIAMOND GRIT.

Description.—Plant winter habit, midseason, short to midtall; stem purple, midstrong, coarse; spike awned, oblong to clavate, middense, inclined; glumes glabrous, white, short, midwide to wide; shoulders midwide, oblique to square; beaks 2 to 15 mm. long; awns 3 to 6 cm. long; kernels red, short to midlong, soft to semihard, usually oval, humped; germ midsized; crease midwide to wide, middeep; cheeks angular; brush midsized, midlong.

This variety is distinguished by its clavate spike and short, oval, semihard kernels.

History.—As recorded by Carleton (*58*, p. 72), "Diamond Grit is a direct cross of Jones Winter Fife and Early Genesee Giant, and is a bearded, white chaffed, semihard, red-grained variety."

The cross was made by A. N. Jones, of Newark, Wayne County, N. Y. On Mr. Jones's stationery it is listed as a variety of wheat which he originated in 1896.

The variety was advertised and distributed by Peter Henderson & Co., seedsmen, of New York City, in 1897.

Distribution.—This wheat is not known to be grown commercially at the present time. It is still included in experiments, however, at several stations in the eastern United States.

Synonym.—Winter Saskatchewan. This name has been used as a synonym for Diamond Grit in advertisements of the variety.

GOLDEN CROSS.

Description.—This variety is similar to Diamond Grit except in having a shorter culm, shorter, more erect and more clavate spike, and a larger kernel. A spike, glumes, and kernels of Golden Cross are shown in Plate XXXVIII, *B*.

History.—This wheat was originated by A. N. Jones, of Newark, N. Y., in 1886. According to Mr. Jones's stationery, it was the first wheat which he produced. Peter Henderson & Co. (*110*) advertised and distributed this variety in 1888, claiming it to be a cross between Mediterranean and Clawson. The sample grown by the writers was obtained from the farm of Max Berg, near Beaverton, Washington County, Oreg., in the summer of 1916.

Distribution.—Reported in 1919 from Kentucky, Michigan, and Ohio. It probably still is grown in Oregon also. Other varieties of wheat sometimes are called Golden Cross.

CHAMPLAIN (PRINGLE'S CHAMPLAIN).

Description.—Plant spring habit, midseason, tall; stem white, strong; spike awned, fusiform, middense, erect; glumes glabrous, yellowish white, midlong to long, midwide; shoulders narrow to midwide, oblique to square; beaks 1 to 5 mm. long; awns, 2 to 7 cm. long; kernels red, short to midlong, usually semihard, ovate; germ midsized; crease midwide, middeep; cheeks angular; brush midsized, midlong to long, collared.

This variety is distinct in having short, wide, semihard red kernels with a long, collared brush. The lower leaves of Champlain are distinctly pubescent. A spike, glumes, and kernels of Champlain wheat are shown in Plate XXXIX, *A*.

History.—The following history of Champlain was published in the Rural New Yorker in 1877 (*13*):

> Champlain was produced in 1870 by Mr. Pringle in his endeavors to unite the hardiness of the Black Sea with the fine qualities of the Golden Drop. Several varieties were the result of this cross, from which the above was chosen as showing increased vigor and productiveness over its parents. A selection from this for the past seven years has now, Mr. Pringle thinks, established its character, and the result is a wheat bearded like the Black Sea with the white chaff of the Golden Drop.

C. G. Pringle did his wheat breeding at Charlotte, Vt., near Lake Champlain. This wheat evidently was named for the lake.

Pringle's Champlain is the name under which the variety first became known. Mr. Pringle apparently, however, did not intend that his name should be a part of the name of any of the varieties of wheat which he distributed.

Distribution.—Grown as Pringle's Champion, chiefly under irrigation, in Yellowstone County, Mont., and Park County, Wyo.

Synonym.—Pringle's Champion. This name is wrongly but most commonly used by growers of the Champlain variety.

JAVA (EARLY JAVA).

Description.—Plant spring habit, early, midtall; stem white, slender, midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong to long, narrow to midwide, easily deciduous; shoulders wanting to narrow, oblique; beaks 2 to 15 mm. long; awns, 2 to 8 cm. long; kernels red, midlong, soft, ovate to elliptical, pointed; germ small to midsized; crease midwide, middeep; cheeks usually angular; brush midsized, midlong, slightly collared.

The above is the description of the most common type of Java, which usually is distinguished by its long beaks. There are many types in the Java variety as grown in the field, including both hard and soft kernels, white and brown glumes, and various lengths of beaks. Plate XXXIX, *B*, shows a spike, glumes, and kernels of Java wheat.

History.—This variety is probably one of the oldest spring varieties grown in the United States. It apparently was first known as Siberian, concerning which the following was recorded in 1837 (*1*):

> "Cultivator" says: Received sample from Dr. Goodsell, of Utica, said to have come from Switzerland. Prolific, heavy yielder of grain (40 bushels) and of flour.

A Siberian variety was also reported from Farmville, Va., in 1849 (*145*, p. 132):

> Wheat.—The favorite varieties of this grain are, first, The Turkey, called also Siberian wheat. A small parcel of this was brought from South Carolina by the late Rev. James Wharey and divided between the late Captain Pemberton and myself. This variety is excellent, weighing remarkably and making superior flour. It is now nearly lost in this neighborhood from admixture and other causes of deterioration.

China Tea, sometimes referred to as Black Tea, wheat is also identical with Java and has the following history, as reported by Klippart (*131*, p. 758):

> Some 12 years since (1845) there was found by a merchant in Petersburg, Rensselaer County, N. Y., six or seven kernels of this kind of wheat, in a chest of black tea, which was sown. It now has the preference of all the different varieties of spring wheat. The straw is very stiff and has never been known to

rust. It thrashes very easily. It should be cut rather early, as it is liable to shell if left till fully ripe. The quality of the flour is equal to any other spring wheat. It is said to yield from 15 to 40 bushes per acre.

China Tea wheat was listed in 1863, in a report of the standing committee of the Iowa Agricultural Society, as the first spring-wheat variety preferred by growers (*4*, p. 518). This fact, together with the identity of the samples grown by the writers and the importance of Java in Iowa, indicates that Java is simply a new name for the China Tea variety. China Tea was reported from New York in 1919.

In 1899 Wallaces' Farmer, of Des Moines, Iowa, published several short articles on the desirability of growing early varieties of wheat and oats. A request was made to their readers to report any variety of spring wheat that was grown which would ripen in Iowa by the Fourth of July. Among several of the varieties that were reported was the Early Java, from C. F. Morton, southeastern Nebraska (*26*). As a result of this request, Early Java wheat was grown in 1900 at the Iowa Agricultural Experiment Station, Ames, Iowa, and on the farm of M. E. Ashby, living 5 miles north of Des Moines. For several years Wallaces' Farmer entered into an active campaign for the distribution of Early Java wheat. The variety thus became quite widely grown in that State. In a recent issue of Wallaces' Farmer the following reference concerning the origin of the variety is given (*33*) :

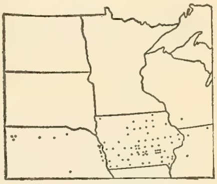


FIG. 56.—Outline map of the north-central United States, showing the distribution of Java wheat in 1919. Estimated area, 55,000 acres.

> About 20 years ago a southeastern Nebraska farmer was growing an early variety of spring wheat under the name of Early Iowa or Early Java. He wrote to Henry Wallace, of Wallaces' Farmer, about it in 1899, and as a result Mr. Wallace wrote about it considerably in the paper and induced a number of Iowa farmers to try it out. In a short time the Early Java became the most popular spring wheat in Iowa. No one knew where it came from originally. . . .

Early Java may be a misspelling of "Early Jowa," the German spelling of Early Iowa, given above as a synonym. This possibly is an explanation of the origin of the name Early Java.

Distribution.—Grown in Illinois, Iowa, Nebraska, and Wisconsin, and as China Tea in New York. (Fig. 56.)

Synonyms.—Black Tea, China Tea, Early Iowa, Siberian, Swedish, and Tea Leaf. Swedish is a name under which samples of Java have been received from Nebraska. It is evidently a local name for Java wheat in that State. Tea Leaf was reported for Java from Iowa. The other synonyms listed above have been mentioned in the history of Java.

ERIVAN.

Description.—Plant spring habit, early, short; stem white, slender, very weak; spike awned, fusiform, middense, nodding; glumes glabrous, white, midlong, narrow; shoulders midwide, usually elevated; beaks 3 to 25 mm. long; awns 2 to 7 cm. long; kernels red, midlong, soft, elliptical, humped; germ small; crease midwide, shallow; cheeks usually angular; brush small, midlong.

Erivan differs from Java chiefly in having an elevated shoulder on the glume.

History.—The Erivan variety (S. P. I. No. 9871) was introduced by the United States Department of Agriculture (*197*) in 1903, from the dry mountain district of the Erivan Government in Transcaucasian Russia, near the border of Persia.

Distribution.—Grown to a limited extent in Wyoming. It has been grown in experiments in the northern Great Plains area and has proved to be a high-yielding, drought-resisting wheat. Its weak stem has prevented it from being of commercial importance.

CONVERSE.

Description.—Plant spring habit, midseason, tall; stem white, midstrong; spike awned, fusiform, middense, inclined to nodding; glumes glabrous, white, midlong, narrow; shoulders wanting to narrow, oblique; beaks 3 to 20 mm. long; awns 3 to 8 cm. long; kernels pale red, midlong, soft to semihard, ovate, humped, acute at base; germ midsized, abrupt; crease midwide, middeep; cheek usually angular; brush midsized, short to midlong.

Converse differs from Erivan in being taller and later and in having a harder kernel.

History.—The origin of Converse is undetermined. The sample here described was obtained in 1908, and the wheat had doubtless been grown for several years previous under the name Red Russian. The variety was renamed in 1920 (*66*, p. 6) and the following information recorded:

> The name Converse is here given to a commercial variety of spring wheat grown in Wyoming under the name Red Russian. The name Red Russian is used for three other varieties in the United States, so a new name has been selected for this variety. The original sample (C. I. No. 4141) was obtained by a representative of the Department of Agriculture from Converse County, Wyo., hence the name.

Distribution.—Grown in Nebraska and Wyoming.

Synonym.—Red Russian is the local name under which this wheat has been grown for several years in the State of Wyoming.

MINTURKI.

Description.—Plant winter habit, midseason, midtall; stem white, weak; spike awned, fusiform, middense, inclined; glumes glabrous, yellowish white, midlong, narrow; shoulders wanting to narrow, oblique; beaks 1 to 3 mm. long; awns 4 to 8 cm. long; kernels red, midlong, semihard, ovate to elliptical, acute; germ small; crease narrow, shallow to middeep; cheeks rounded; brush small, midlong to long.

This variety is very winter hardy. It resembles Turkey except in having softer kernels and in being more winter hardy.

History.—This variety is the progeny of a cross between Odessa and Turkey, made at the Minnesota Agricultural Experiment Station, University Farm, St. Paul, in 1902, during the time Prof. W. M. Hays was in charge of plant breeding there. Odessa was used as the female parent and Turkey as the male parent. Of the many selections made from the progeny of this cross two have shown sufficient value to be named and distributed by the Minnesota station. This selection was first known as Minnesota No. 1507, but was named Minturki in 1919 (*106*, p. 17–28) when it was first distributed.

Distribution.—Grown to a slight extent in Minnesota and by experiment stations in other Northern and Western States.

Synonym.—Minnesota No. 1507.

HUSSAR (RED HUSSAR).

Description.—Plant winter habit, late, midtall; stem white, slender, weak to midstrong; spike awned, fusiform, middense to lax, inclined to nodding; glumes glabrous, white, long, midwide, easily deciduous; shoulders midwide, oblique to square; beaks 1 to 3 mm. long; awns 3 to 8 cm. long; kernels red, midlong, semihard, ovate, humped; germ midsized; crease midwide, shallow to middeep, pitted; cheeks usually rounded; brush midsized, long.

This variety is similar to Turkey, but has softer and more humped kernels. The strain described above, which is a pure line from the original Red Hussar, apparently is immune to bunt (stinking smut).

History.—The origin of Hussar (Red Hussar) is undetermined. It was grown by the Illinois Agricultural Experiment Station, Urbana, Ill., for the first time in 1906 (*122*, p. 73) and is still grown by that station. The variety was obtained by the United States Department of Agriculture from the above source in 1913.

Distribution.—Hussar is not known to be grown commercially, but is grown by several experiment stations in the United States.

PESTERBODEN.

Description.—This variety is nearly identical with Turkey, except in being slightly taller and in having somewhat larger and softer kernels. Some of the varieties listed below as synonyms contain strains which can not be distinguished from Turkey.

History.—This variety was first introduced into the United States by the United States Department of Agriculture in 1900 from Budapest, Austria-Hungary.

Distribution.—This variety and those synonymous were not reported grown in 1919. The wheat has been grown by many experiment stations and was distributed to some extent in former years. The writers have been informed that Pesterboden is being grown in Wisconsin.

Synonyms.—Budapest, Hungarian, Torgova, and Weissenburg.

Budapest was first introduced into the United States in 1892 from Budapest, Hungary, by C. G. A. Voigt, a miller of Grand Rapids, Mich. (*75*, p. 142). Several other introductions under the name of Budapest have been made, most of which were practically identical with Turkey. Some strains, however, are slightly taller, with a somewhat softer kernel.

Hungarian is the name under which many introductions of hard red winter wheat have been made. Most of these strains were identical with Turkey, as were almost all of the introductions from Hungary. However, some strains are slightly taller and have somewhat softer kernels than typical Turkey wheat. Some of the earlier samples obtained by the department under this name were from the Argentine exhibit at the Louisiana Purchase Exposition, in 1904. Torgova was introduced by M. A. Carleton, of the United States Department of Agriculture, in 1900. The original sample was grown near Torgova, an extreme northern portion of the Stavropol Government on the Tsaritsyn Branch of the Vladikarkaz Railway. It was obtained from the Turkin Flour Milling Co., at Tsaritsyn (S. P. I. No. 6007). Weissenberg was introduced into the United States from Budapest, Austria-Hungary, in 1900 by the United States Department of Agriculture (*197*, S. P. I. No. 5499).

BLACKHULL (CLARK'S BLACK HULLED).

Description.—Plant winter habit, early to midseason, midtall to tall; stem white, fine, midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, white, with black stripes, midlong, midwide; shoulders wanting to narrow, oblique; beaks 1 to 3 mm. long; awns 2 to 7 cm. long; kernels red, midlong, semihard to hard, usually elliptical; germ small; crease narrow, shallow; cheeks rounded; brush midsized, midlong.

This variety is a few days earlier than Turkey and has a softer kernel. Except under certain unfavorable weather conditions, the glumes of Blackhull have black stripes on the surface or sometimes are almost entirely black.

History.—This variety was originated by Earl G. Clark (*63*), of Sedgwick, Kans., as a selection from a field of Turkey. He states:

> The Clark's Black Hull wheat is a wonderful hardy variety of wheat that I have developed from three black heads found in 1912. It has proven superior to all other varieties of winter wheat.

The variety was first distributed by Mr. Clark in the fall of 1917.

Distribution.—Grown in Harvey County, Kans.

Synonym.—Black Chaff. This name is occasionally used for the Blackhull variety.

TURKEY (TURKEY RED).

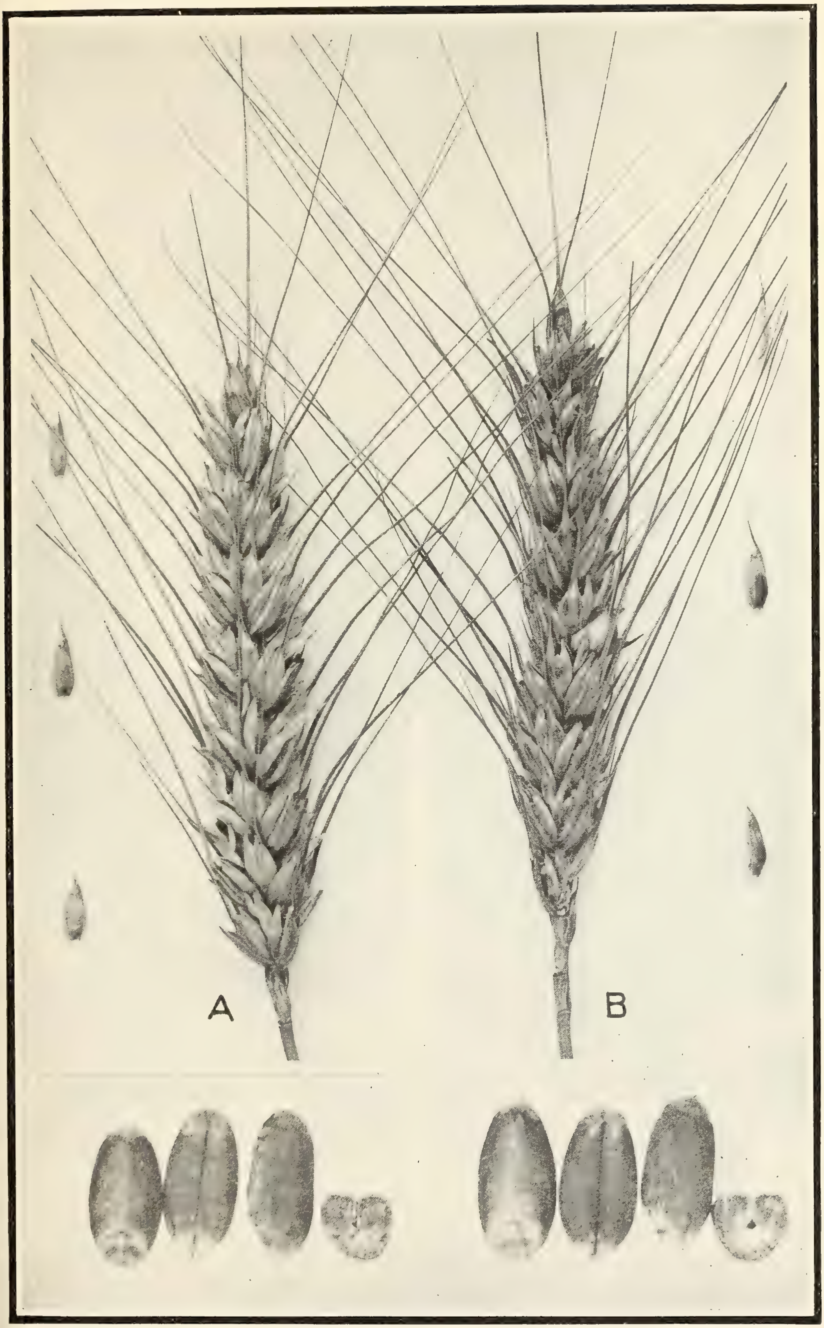
Description.—Plant winter habit, midseason, midtall; stem white, slender, weak; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide; shoulders wanting to narrow, oblique; beaks 2 to 8 mm. long; awns 3 to 8 cm. long; kernels dark red, midlong, hard, ovate to elliptical; germ small; crease narrow to midwide, middeep; cheeks rounded; brush small, midlong.

This variety is winter hardy and drought resistant, which accounts for its wide cultivation. The first leaves of the stool are narrow and of a dark-green color. The kernels are usually distinguishable because of their dark-red color and small germ. A spike, glumes, and kernels of Turkey wheat are shown in Plate XL, *A*, and a single spike in Plate IV, Figure 5.

History.—Turkey is the name most commonly used for the Crimean group of hard winter wheats grown in the United States. Many histories of this wheat have been written. That recorded by Carleton (*60*, p. 298–399) is given here, however, as he introduced many strains and spent much time in an attempt to determine accurately the history of the wheat.

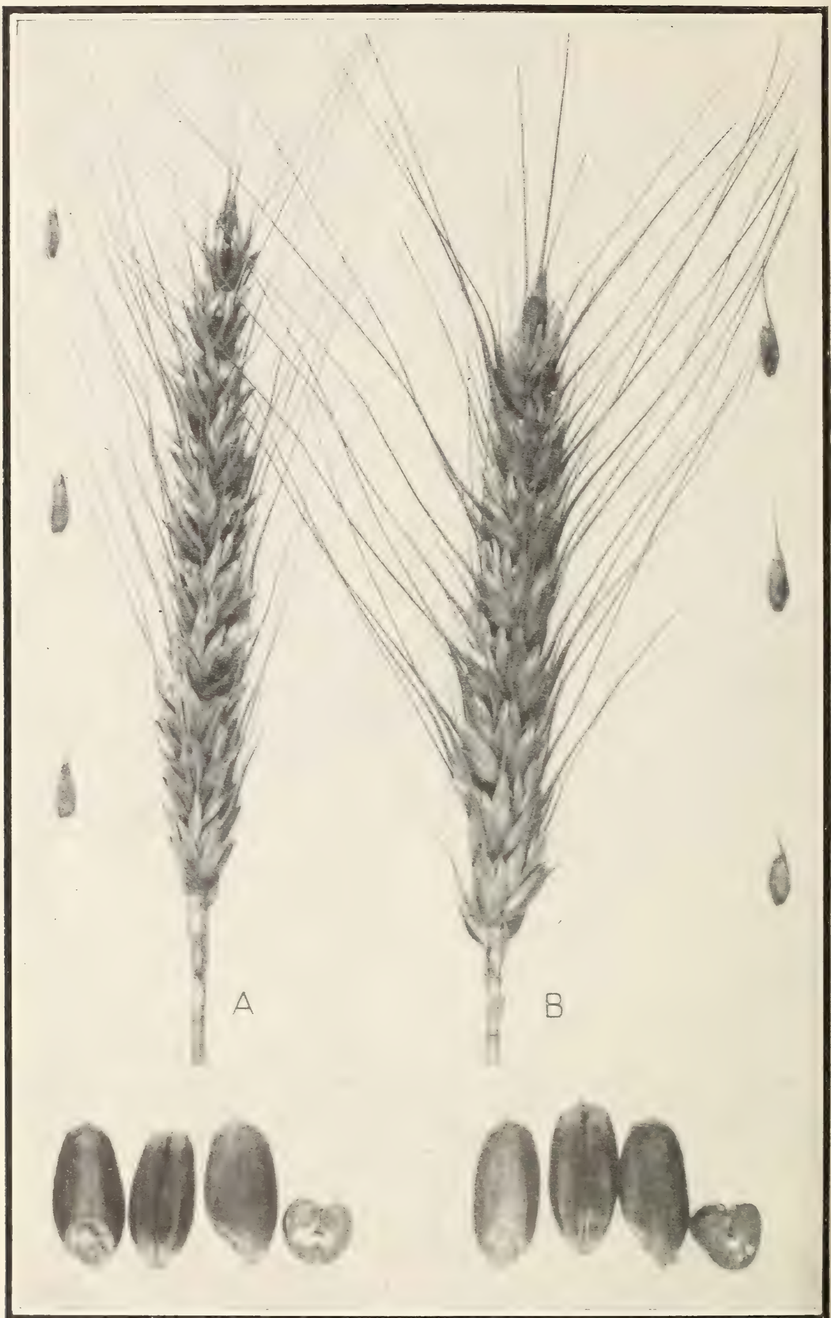
> The original home of hard winter wheat is in the area of Russia just north and east of the Black Sea and north of the Caucasus Mountains. The area includes chiefly the governments of Taurida (including the Crimea), Ekaterinoslav, Kharkof, and Stavropol, and the Don and Kuban territories. In that region the wheat is generally called simply winter wheat, but is known locally by various names as Krimka (Crimean), Kharkof, Beloglina, Ulta, Torgova, etc. . . .
>
> The history of hard winter wheat in the United States is closely associated with the movement of Russian Mennonite immigrants to the middle Great Plains. These people originally went from west Prussia to southern Russia about 1770 because of certain land grants and civil privileges offered by the Government under Empress Catherine. One hundred years later their descendants desiring further advantages to be obtained in America emigrated to the middle Great Plains and settled principally in Kansas. The greater number were from the Molochna colonies in northern Taurida, but some were from the Crimea proper, and others from Ekaterinoslav. The first settlements in Kansas were made in 1873, near Newton, Halstead, and Moundridge. Each family brought over a bushel or more of Crimean wheat for seed, and from this seed was grown the first crop of Kansas hard winter wheat. Bernard Warkentin, a miller, who erected mills at Newton and Halstead, was chiefly instrumental in introducing the Turkey wheat, but in this pioneer movement of the Mennonites two other men were associated, Christian Krehbiel, first a farmer, but who later in 1886 erected a mill at Moundridge, and C. B. Schmidt, acting as immigration agent for the Santa Fe Railroad.

Distribution.—Grown in Alabama, Arizona, Arkansas, California, Colorado, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Mexico, New York, North Dakota,



TURKEY (A). KANRED (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



PRESTON (A). KOTA (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, Wisconsin, Wyoming. This distribution is shown in Figure 57.

Synonyms.—Alberta Red, Argentine, Bulgarian, Crimean, Defiance, Egyptian, Hard Winter, Hundred-and-One, Hungarian, Improved Turkey, Kharkof, Lost Freight, Malcome, Malakof, Minnesota Red Cross, Minnesota Reliable, Pioneer Turkey, Red Russian, Red Winter, Romanella, Russian, Tauranian, Theiss, Turkey Red, Turkish Red, Ulta, Wisconsin No. 18, Worlds Champion.

Alberta Red is a name which was originally given a lot of Turkey wheat grown about 20 miles from Calgary, Alberta, Canada, in 1906. Selections of heads of the variety were made under the direction of W. M. Gilfoy, manager of the Calgary Milling Co. An extra good sample was thus obtained, which was distributed under the name Alberta Red. Argentine is a name under which a strain of Turkey wheat has been grown at the Sherman County branch station, Moro, Oreg., for a number of years. In the experiments there it has proved to be one of the highest yielding strains of Crimean wheat. The wheat was obtained on the stock exchange, Marseilles, France, in 1900, by W. T. Swingle, of the Department of Agriculture (*197*, S. P. I. No. 5354). It is recorded as being one of a collection of different types of macaroni wheat, but this particular lot proved to be common wheat of the Turkey type. Bulgarian is a name under which a sample of Turkey wheat was obtained from the Indiana Agricultural Experiment Station in 1913.

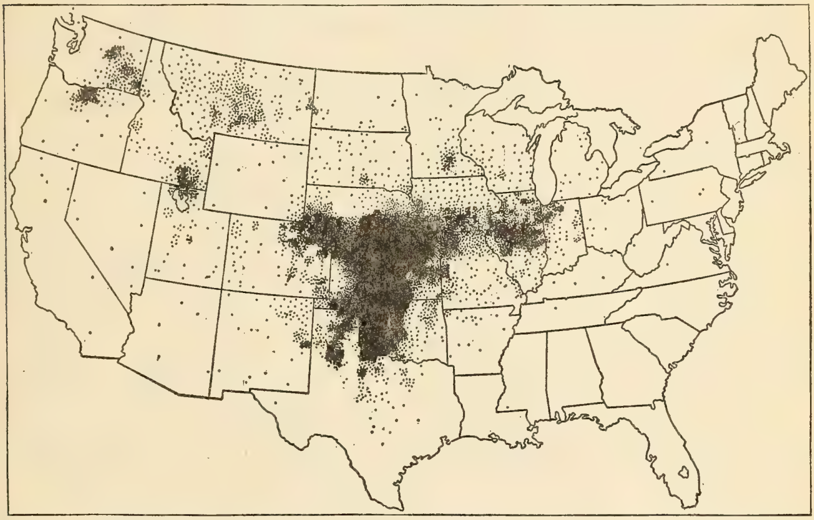


FIG. 57.—Outline map of the United States, showing the distribution of Turkey wheat in 1919. Estimated area, 21,588,300 acres.

Crimean is the name properly used for this whole group of hard red winter wheats. It also has been used as a varietal name for separate introductions. The first introduction of the wheat under this name is thought to have been made by Carleton in 1900 (*197*, S. P. I. No. 5635) from Kurman-Kemelchi, Central Crimea, Russia. Defiance is a name under which a lot of Turkey wheat was distributed by the Iowa Seed Co., of Des Moines, Iowa. It was advertised as their novelty of 1900, which was the first year the name was applied to a hard red winter wheat. Egyptian is a name sometimes used for Turkey, as well as other varieties. A sample of Turkey under this name was obtained from Dumbell, Wyo., in 1919. In a letter dated July 8, 1919, accompanying the above sample, C. A. Smith states: "This wheat was brought direct from Egypt by a missionary and is the same wheat my father used to grow in Michigan." Egyptian was reported in 1919 from Indiana, Michigan, Missouri, Ohio, Wyoming, and Wisconsin. A part of this, however, is believed to be other varieties, such as Gipsy and Egyptian Amber (Fulcaster).

Hard Winter is a name commonly used for Turkey wheat, but is properly used only as a class or grade name for this type of wheat. Hundred-and-One, or 101, is a name used for Turkey wheat distributed by the 101 Ranch, of Bliss, Okla. The variety is grown under this name to some extent in Kansas, Missouri, Oklahoma, and Texas. Hungarian is the name used for some samples of Turkey wheat, but also for types identical with Pesterboden. The Hungarian wheat is more fully discussed along with the Pesterboden variety. Improved Turkey is a selected strain of Turkey developed at the Kansas station and is also known as P–706. It has been used in cooperative experiments conducted by that station with farmers, but otherwise is not grown commercially.

Kharkof, for the most part, is a wheat morphologically identical with Turkey. Several introductions were made which came from a region much farther north, and it was, therefore, thought to be a much more winter hardy wheat than Turkey. The Kharkof wheat was first introduced into the United States by M. A. Carleton in 1900, from Starobelsk, Kharkof, Russia (*197*, S. P. I. No. 5641; C. I. No. 1442). Two other strains (S. P. I. No. 7467, C. I. No. 1583; and S. P. I. No. 7786, C. I. No. 2193, or C. I. No. 6206), were obtained in 1901 through Dr. A. Boenicke, president of the Kharkof Agricultural Society. The latter of these two introductions contain a considerable portion of long-beaked strains more similar to Beloglina than the true Kharkof. A fourth lot of Kharkof (S. P. I. No. 9125, C. I. No. 2208), consisting of 450 bushels, was received in 1902 from the Starobelsk district through Mr. E. A. Bessey. For several years these strains of Kharkof wheat gave slightly better results than the ordinary Turkey wheat of Kansas and became quite widely distributed in that State, as well as in Wyoming and Montana. In recent years, however, little difference in hardiness or yield has been observed, except in northern Wyoming and in Montana, where it still consistently yields better than Turkey.

Lost Freight is a name used for the Turkey or Hundred-and-One variety in Missouri. Malcome is the name under which a sample of Turkey was obtained from Hartford City, Ind., in 1919. This is probably only a confusion of the name Malakof.

Malakof is a name under which many strains of Crimean wheat have been introduced and grown. It is thought to have been first distributed by the Ratekin Seed Co., Shenandoah, Iowa, in the early nineties from seed which was said to have come from Russia. Malakof was reported from Illinois, Indiana, Kansas, Michigan, Missouri, and Oklahoma. Minnesota Red Cross is the name under which a sample of wheat similar to Turkey was obtained by the department from the Oklahoma Agricultural Experiment Station in 1917. Minnesota Reliable is the name under which a sample of wheat similar to Turkey was obtained from the Illinois Agricultural Experiment Station in 1917.

Pioneer Turkey is a name used for Turkey by P. J. Jennings, of McCracken, Kans. About 1910 he obtained an old sample of Turkey wheat from an elevator man in Topeka, who believed it to be from the earliest Turkey wheat grown in Kansas. Concerning this, Mr. Jennings has written:[22]

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[22] Correspondence with A. F. Swanson, Hays Experiment Station, Hays, Kans., dated September 12, 1920.

We kept selecting and planting same with every care until at last our whole farm was producing this strain and as pure as it was possible to be had, and to-day it has under this treatment almost developed an individuality all its own. Knowing its relation to other days and as we had given it so much care and attention without any aid or encouragement from any one and had in the meantime lost track of the man who had helped us get the first seed, we decided, for the want of a better name, to call the wheat "Pioneer Turkey," in honor of its early history and, too, because our farm on which all this work was done was known as "Pioneer Place."

Red Russian is a name commonly used by farmers for Turkey wheat in Kansas and other hard winter-wheat-producing States. Red Winter, like Red Russian, is a name commonly used for Turkey wheat by farmers. It has also been used as a varietal name for several strains of Turkey wheat grown by experiment stations. Romanella is a name under which a sample of wheat similar to Turkey was obtained by the Department of Agriculture from Haage & Schmidt, Erfurt, Germany, in 1904. Russian is a name commonly used for Turkey wheat by Kansas farmers. Tauranian is the name recently applied to a sample of wheat practically identical with Turkey which was obtained by G. W. Ripka, Salina, Kans., from an agricultural college in the Province of Taurida, Russia, in the spring of 1914. Some strains of this wheat have long beaks and are apparently identical with Beloglina. This wheat has been grown at the Kansas Agricultural Experiment Station since 1916. Mr. Ripka has grown about 1,000 acres of it annually since 1914, and has distributed the seed quite generally in his neighborhood. Theiss is the name of an introduction of Turkey wheat from Budapest, Austria-Hungary, made in 1900 by the United States Department of Agriculture. Earlier introductions of Theiss have been grown in the eastern part of the United States.

Turkey Red is the name first used for Turkey wheat throughout Kansas in the early seventies. During the last decade, however, the word Red generally has been omitted. Turkish Red is a name long used for Turkey wheat in Iowa. This is the name under which the wheat was distributed in 1886 by George W. Franklin, of Atlantic, Iowa, who is reported to have been the first man to distribute this wheat in that State (*54*, p. 263).

Ulta wheat, which is identical with Turkey, was first introduced into the United States from Constantinovskol, 40 miles east of Stavropol, in north Caucasus, in 1900 by M. A. Carleton, of the United States Department of Agriculture (*197*, S. P. I. No. 5638). Wisconsin No. 18 is a lot of Turkey wheat distributed quite widely in Wisconsin by the Wisconsin Agricultural Experiment Station. Worlds Champion is a name under which a sample of Turkey was obtained from the Illinois Agricultural Experiment Station in 1917.

IOWA NO. 404.

Description.—Iowa No. 404 is identical with Turkey morphologically, but in experiments in Iowa it has shown greater winter hardiness and proved more productive.

History.—It is a pure-line selection of Turkey (Minn. No. 529) developed at the Iowa Agricultural Experiment Station and first distributed by them in the fall of 1913 as a winter-hardy and high-yielding pure strain of Turkey wheat.

Distribution.—Grown in Illinois, Iowa, and Wisconsin.

IOWA NO. 1946.

Description.—This is another pure line similar to Turkey, but superior to it in yield and winter hardiness.

History.—Iowa No. 1946 is a more recent and apparently superior selection developed at the Iowa Agricultural Experiment Station. It is a pure line from a mixed strain of wheat known as Iowa No. 1661, which was supposed to have been selected from Banat. The latter was introduced from Russia, but was originally from the Banat district in Hungary.

Distribution.—Grown to a small extent in Iowa in 1921.

MONTANA NO. 36.

Description.—This variety can not be distinguished from Turkey, but has proved superior to it in winter hardiness and yield in experiments and commercal trials in Montana.

History.—It is a pure-line selection of Kharkof developed at the Montana Agricultural Experiment Station, Bozeman, Mont., and distributed by them since the fall of 1915 as a winter-hardy, high-yielding strain.

Distribution.—Grown in Montana.

NEBRASKA NO. 60.

Description.—Nebraska No. 60 is practically identical with Turkey in all taxonomic characters.

History.—This is a high-yielding pure-line selection of Turkey wheat developed at the Nebraska Agricultural Experiment Station. It was distributed for commercial growing and for testing at experiment stations in other States in the fall of 1918. Another selection, Nebraska No. 6, was distributed at the same time.

Distribution.—Grown in Nebraska.

WISCONSIN PEDIGREE NO. 2.

Description.—This variety is identical with Turkey.

History.—Wisconsin Pedigree No. 2 is a pure-line selection of Turkey wheat developed by the Wisconsin Agricultural Experiment Station and distributed by them as a high-yielding strain since the fall of 1918.

Distribution.—Grown in Wisconsin.

KANRED.

Description.—Plant winter habit, midseason, midtall; stem white, weak; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide; shoulders narrow, oblique to elevated; beaks 3 to 25 mm. long; awns 3 to 10 cm. long; kernels dark red, midlong, hard, ovate, to elliptical; germ small; crease narrow to midwide, middeep; cheeks rounded; brush small, midlong.

Kanred is very similar to Turkey, but is slightly more winter hardy and slightly earlier and can be distinguished from that variety by its longer beaks on the outer glumes and by its resistance to some forms of both leaf and stem rust. This resistance to rust is an important factor in the ability of the variety to outyield Turkey wheat in many sections. It is also about equal to Turkey in milling and bread-making value. A spike, glumes, and kernels of Kanred are shown in Plate XL, *B*.

History.—Kanred is the product of a single head selected in 1906 from the Crimean variety (C. I. No. 1435), which had been introduced into the United States from Russia by the United States Department of Agriculture. The selection from which it descended was one of 554 head selections made in 1906 by Dr. H. F. Roberts, of the Botany Department of the Kansas Agricultural Experiment Station (*162*). In 1911 the more promising strains were included in experiments by the Agronomy Department of the Kansas station, and several of them, including Kanred, were grown in field plats. In 1916 it was discovered to be rust resistant. During these years of preliminary testing of the Kanred wheat it was known by the number P–762. In 1917 it was named Kanred (a contraction of Kansas Red). About 4,000 acres were seeded to this variety in the fall of 1917, more than 50,000 acres in the fall of 1918, and not less than 500,000 acres in the fall of 1919.

Distribution.—Kanred was reported in 1919 from 23 counties in Kansas, 1 county in Michigan, and 5 counties in Oklahoma. (Fig. 58.) Probably 1,500,000 to 2,000,000 acres were sown to Kanred in the fall of 1920. It is grown also at experiment stations in most sections of the United States.

Synonyms.—P–762, P–1066, and P–1068. P–762, as shown above, was the designation under which Kanred wheat was known from the date of its selection, in 1906, until the time when it was named. P–1066 and P–1068 are two other pure-line selections developed at the Kansas Agricultural Experiment Station in much the same way as was Kanred. Both these strains have the rust resistance of Kanred and are identical in all morphological characters, but neither has been distributed for commercial growing.

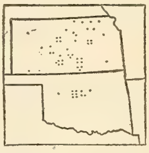

FIG. 58.—Outline map of a portion of the central United States, showing the distribution of Kanred wheat in 1919. Estimated area, 97,500 acres.

BELOGLINA.

Description.—This variety is nearly identical with Kanred, except that it is slightly later and does not have the resistance of that variety to stem and leaf rust.

History.—Beloglina was introduced from Russia by the United States Department of Agriculture. Four introductions have been made. The first lot was obtained by M. A. Carleton in 1900 from Rostov on Don, Russia (*197*, S. P. I. No. 6012), where it was claimed to have been one of the most hardy red winter wheats known. It was grown near Beloglinskaya, in the northern portion of the Stavropol Government, a region of great extremes of temperature and moisture. This wheat has proved somewhat more winter hardy than commercial strains of Turkey and Kharkof, but not enough so to make it become an important variety.

Distribution.—This variety is not known to be grown commercially, but is grown at many experiment stations in the western United States.

BACSKA.

Description.—The Bacska wheat grown in Wisconsin is very similar to Kanred, except that it is slightly taller and later and does not have the resistance of Kanred to stem and leaf rust.

History.—The original Bacska wheat (*197*, S. P. I. No. 5498) was introduced from Budapest, Austria-Hungary, in 1900 by the United States Department of Agriculture. A pure-line selection made from the original introduction by E. J. Delwiche, of the Wisconsin Agricultural Experiment Station at Ashland, Wis., is the only Bacska wheat now known to be commercially grown. It is sometimes called Wisconsin Pedigree No. 408.

Distribution.—This variety was reported in 1919 from Bayfield and Price Counties, Wis., where it made up 17 and 2 per cent of the wheat acreage, respectively.

Synonym.—Wisconsin Pedigree No. 408.

PRESTON (VELVET CHAFF).

Description.—Plant spring habit, midseason, midtall; stem white, sometimes faintly purple, especially on lower internodes, midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide, easily deciduous; shoulders wanting to narrow, oblique; beaks 1 to 3 mm. long; awns 2 to 7 cm. long; kernels red, midlong, hard, ovate; germ midsized; crease narrow to midwide, shallow to middeep, triangular; cheeks angular; brush midsized, midlong.

The kernels of Preston are distinguished from other hard red wheats by the dull seed coat and the rather narrow triangular crease. A spike, glumes, and kernels of Preston wheat are shown in Plate XLI, *A*.

History.—The Preston variety was bred from a cross between Ladoga, a Siberian wheat, and Red Fife. The hybrid was made by Dr. William Saunders, at the Central Experimental Farm, Ottawa, Canada, in 1888. It was grown at the experiment station at Indian Head, Saskatchewan, as early as 1893, and was sent to the Minnesota Agricultural Experiment Station for growing in the spring of 1896.

It is not known definitely that the "Velvet Chaff" wheat now widely grown is Preston and is the result of the above distribution. It is probable that some of this wheat is an older variety from which the original name had been lost. In addition to the synonyms, listed below, which represent sorts apparently identical with the commercial Velvet Chaff spring wheat, there are types of wheat found within the Java variety which can not be distinguished from the Velvet Chaff or Preston.

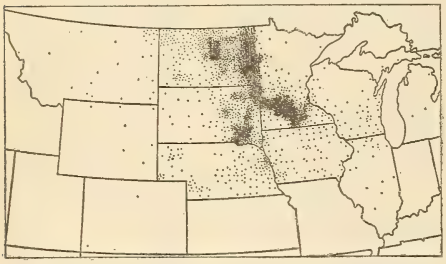

FIG. 59.—Outline map of the northwestern United States, showing the distribution of Preston wheat in 1919. Estimated area, 2,233,200 acres.

Distribution.—Grown (principally as "Velvet Chaff") in Colorado, Illinois, Iowa, Kansas, Michigan, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Wisconsin, and Wyoming. (Fig. 59.)

Synonyms.—Bearded Fife, Blue Ribbon, Climax, Golden Drop, Johnson, Johnson's Early Fife, Minnesota No. 188, Red Fife, Velvet Chaff.

Bearded Fife is the name chiefly used for the Preston variety in South Dakota since 1904, or earlier, although in more recent years it is commonly called Velvet Chaff. The name Bearded Fife was used to distinguish this wheat, which was also often called Red Fife, from the well-known Red Fife wheat of Canada. Blue Ribbon is the name of a selected lot of a wheat, apparently identical with Preston, distributed by H. E. Krueger, of Beaver Dam, Wis., since about 1909. He stated[23] that the wheat "was selected 10 years ago, from an old fife variety, and ripens about with Marquis." Blue Ribbon is grown in Illinois, Iowa, Michigan, North Dakota, Ohio, and Wisconsin. Climax, sometimes called South Dakota Climax, was first obtained by the South Dakota Agricultural Experiment Station in 1903 from John Carpenter, Hetland, S. Dak. It apparently is the Preston variety and was formerly grown to a considerable extent under the name Climax in South Dakota. Golden Drop is the name under which a sample of wheat identical with Preston was obtained in

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[23] Correspondence with the Office of Cereal Investigations, dated Apr. 26, 1917.

Iowa in 1919. A definite history of the bearded spring Golden Drop variety is not available, but this is probably an old English wheat. A spring wheat similar to the above was grown under this name in New Hampshire in 1872 (*9*, p. 492).

Johnson is a name of a wheat similar to or identical with Preston. A Johnson or No. 55 has been reported by J. M. Thorburn & Co. as "an amber, bearded, white-chaff variety," originated in 1889 by E. S. Carman, then editor of the Rural New Yorker (*191*, p. 48). Rural New Yorker No. 55 also was described in 1888 (*23*, p. 523) as a "pure wheat cross. Medium to ripen. Stems yellow. Heads average nearly 4 inches. Eight breasts to a side. Chaff white, heavily bearded, three to four grains to a breast, fair size, bright amber color, hard regular heads, i. e., not inclined to club." In 1890 the Rural New Yorker (*24*, p. 516) reported "No. 55 has been named 'Johnson' after Prof. S. W. Johnson, of Yale." A Johnson wheat was grown in California as early as 1871 (*7*).

> The Marysville "Appeal" has seen some samples from a field of wheat growing near Yuba City which are reported to be an average of the crop of about 40 acres of the bearded Chile variety and give promise of a good crop without further rain. The proprietor estimates a yield of from 30 to 40 bushels per acre. This variety of wheat is highly prized by the grain growers of Sutter, and is known as the Johnson wheat.

Johnson wheat was reported in 1919 from Iowa, Minnesota, South Dakota, and Wisconsin. Samples of this wheat resemble Java and Dixon as well as Preston. Johnson's Early Fife is a name used for the wheat which later became known as Bearded Red Fife or Red Fife bearded, which is identical with the commercial Velvet Chaff or Preston. Wheeler and Balz (*203*) state:

> The so-called Red Fife, a hard, red, bearded wheat, . . . The origin of this variety, which is also called Golden Fife and Johnson's Early Fife, is somewhat obscure.

It is not certain that this wheat is identical with other lots of Johnson.

Minnesota No. 188 is a number given by the Minnesota Agricultural Experiment Station to Preston wheat which was received from Dr. William Saunders, of Ottawa, Ontario, Canada. The following extract is from the records of the Agronomy Division of the Minnesota station:

> Minnesota 188 was originated by Dr. William Saunders, of the Canadian Experimental Farms. It was the result of a cross between Red Fife and Ladoga made in 1889. It was improved by selection by Dr. Saunders and received at Minnesota in 1896. As introduced to farmers in Minnesota it contained both red and white seeds, and it was recalled. It should not be considered as a Minnesota pedigree.

Preston wheat from the above source, frequently designated as Minnesota No. 188, is still grown to a considerable extent in Minnesota. Red Fife is a name under which Preston wheat was grown in South Dakota as early as 1905. Although incorrectly applied, this name continued in use for several years.

Velvet Chaff is a name which came into use about 1905 for a wheat similar to Preston or identical with it. Just how and when this particular name arose is not known. By 1912 the wheat grown under this name was quite widely grown in the Dakotas and Minnesota, and the name Velvet Chaff was used by the Minneapolis Chamber of Commerce and the Chicago Board of Trade as a grade name. By 1914, however, this wheat was included in the northern grades of wheat and the name Velvet Chaff was abandoned as a grade name. The name has continued in use, however, as a varietal name for the wheat on farms. The only observable difference between this wheat and the true Preston from Canada is that the latter more often shows a purple tinge in the stems and has a slightly rougher seed coat. Velvet Chaff was reported in 1919 from Idaho, Illinois, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Wyoming, and Wisconsin. As the name Velvet Chaff is a misnomer when applied to this type of wheat, the name Preston has been used in preference to it by the United States Department of Agriculture and by most experiment stations since 1915. It is thought by the writers that most of the wheat grown under the name of Velvet Chaff and other synonyms above recorded is really the Preston variety, although some of it is doubtless of earlier origin.

KOTA.

Description.—Plant spring habit, midseason, midtall; stem white, weak to midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide; shoulders midwide, square to elevated; beaks narrow, 3 to 20 mm. long; awns 3 to 8 cm. long; kernels red, midlong, hard, ovate to elliptical, slightly humped; germ small; crease wide, usually shallow; cheeks usually angular; brush small, short to midlong.

Kota can be distinguished from Preston by the longer beaks and elevated shoulders. The kernels are more humped and have a smaller germ. Kota is resistant to many forms of stem rust and also is quite drought resistant. It also is a good milling and bread-making wheat. A spike, glumes, and kernels of Kota are shown in Plate XLI, *B*.

History.—The Kota variety was obtained in Russia by Prof. H. L. Bolley, of the North Dakota Agricultural College, in 1903, while making a study of the flax industry of Europe for the United States Department of Agriculture. It was introduced either as a separate lot, later designated by Professor Bolley as "R. B. R. 3," or as a mixture in a sample of durum wheat. It recently was separated from Monad durum wheat, found to be resistant to some forms of stem rust and to have high agronomic and milling values, and was named Kota in 1919 by Waldron and Clark (*200*, p. 187–195). The name is a part of the name North Dakota.

Distribution.—Grown to a small extent in Cass County, N. Dak., in 1920. It is also grown at several experiment stations and is used as a parent in breeding for rust-resistant spring wheats.

Synonym.—"R. B. R. 3." This is the designation used by Professor Bolley, of the North Dakota Agricultural Experiment Station, for a wheat identical with Kota. According to Professor Bolley, R. B. R. 3 was one of his original introductions from Russia in 1903, introduced as S. P. I. No. 10214.[24] The unpublished record for this number in the Office of Foreign Seed and Plant Introduction is "winter wheat from Balachof, Tambof Government," as one of 25 lots of wheat introduced from Russia by Professor Bolley in 1903. In 1911 Professor Bolley distributed his "R. B. R. 3" to several farmers and to the Langdon substation, but the variety never became commercially established by that distribution. In the spring of 1919, after the discovery of resistance to stem rust in Kota and its similarity to "R. B. R. 3," Professor Bolley distributed a second lot, consisting of about a bushel of seed, to Mr. Jalmer Herre, Kelso, N. Dak., who was the first farmer to increase it.

PIONEER.

Description.—Plant spring habit, early, midtall; stem usually white, a faint purple sometimes appearing on lower internodes, weak to midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong to long, narrow; shoulders wanting to narrow, oblique; beaks 1 to 5 mm. long; awns 2 to 5 cm. long; kernels dark red, midlong, hard, ovate to elliptical; germ small to midsized; crease midwide, middeep; cheeks angular; brush midsized, short.

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[24] Correspondence with J. A. Clark, Office of Cereal Investigations, dated Apr. 18, 1919.

Pioneer differs from Preston chiefly in being several days earlier and in having a darker and harder kernel.

History.—Pioneer is of hybrid origin, having originated from the progeny of a cross made in 1903 by Dr. C. E. Saunders, Dominion cerealist, at the Central Experimental Farm, Ottawa, Canada, between Riga and Preston.

Distribution.—Grown in experiments at field stations in the northern Great Plains since 1915. It has proved to be a fair-yielding variety of high milling quality. It has not proved superior to Marquis, however, and has not become commercially grown in the United States.

RUDY.

Description.—Plant winter habit, midseason to late, midtall to tall; stem white, weak to midstrong; spike awned, linear fusiform, lax, inclined to nodding; glumes glabrous, yellowish white with black-striped margins, midlong, wide; shoulders midwide, usually oblique; beaks 1 to 5 mm. long; awns 3 to 8 cm. long; kernels red, long, soft, usually elliptical; germ small; crease wide, middeep; cheeks rounded; brush midsized, midlong.

This variety is distinct in having black stripes along the margins of the glumes. A spike, glumes, and kernels of Rudy are shown in Plate XLII, *A*.

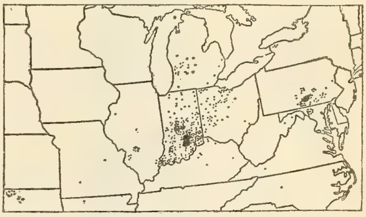


FIG. 60.—Outline map of a portion of the eastern United States, showing the distribution of Rudy wheat in 1919. Estimated area, 399,400 acres.

History.—The origin of Rudy wheat has been recorded by Carleton (*58*, p. 65) as follows:

> One of the best of the most recently produced varieties is the Rudy, which was originated at Troy, Ohio, in 1871, by M. Rudy, through a careful propagation of the seed from a superior and a distinct stool of wheat found in a large field.

Rudy wheat was not included in the varietal experiments of the Ohio Agricultural Experiment Station until 1892. It is reported as having been introduced into Michigan, however, from western Ohio, in 1891.

Distribution.—Grown in Arkansas, Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, Missouri, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Virginia, and West Virginia. (Fig. 60.)

Synonyms.—Anti-Rust, Black Mediterranean, Early Rudy, Kentucky Giant, and Queen of New York.

Anti-Rust is the name under which a sample of Rudy was obtained from Indiana in 1919. The name is wrongly used because the variety is not rust resistant. Black Mediterranean was also obtained from Indiana in 1919. The name is doubtless due to the black stripes on the glumes and because Rudy is very similar to Mediterranean except in glume color. Early Rudy is the name under which the Rudy variety has recently been grown by the Indiana Agricultural Experiment Station. Kentucky Giant is the name under which a sample of Rudy was obtained from Illinois in 1919. This name usually is applied to the Fulcaster variety. Queen of New York is a name under which a sample of Rudy was obtained from the Indiana Agricultural Experiment Station through the Cornell University station.

GLUTEN (GLUTEN B 86).

Description.—Plant winter habit, midseason, midtall to tall; stem white, midstrong; spike awned, fusiform, lax, nodding; glumes glabrous, white, midlong to long, midwide; shoulders midwide, oblique to square; beaks 2 to 15 mm. long; awns 3 to 7 cm. long; kernels red, long, soft, usually elliptical; germ small to midsized; crease midwide, middeep; cheeks usually angular; brush midsized, midlong to long.

This variety has a more nodding spike than Rudy and does not have the black stripes on the glumes.

History.—Gluten B 86 was first obtained by the United States Department of Agriculture from the Indiana Agricultural Experiment Station, in 1913, which in turn obtained it from the California station in 1902. Its origin is undetermined.

Distribution.—Grown by the Indiana and Wisconsin Agricultural Experiment Stations. It is not known to be grown commercially.

NIGGER.

Description.—Plant winter habit, midseason, midtall to tall; stem purple, midstrong to strong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, wide; shoulders midwide, oblique to square; beaks 1 to 2 mm. long; awns 2 to 6 cm. long; kernels red, long, soft, ovate to elliptical, slightly humped; germ midsized; crease midwide, deep, pitted; cheeks rounded to angular; brush midsized, midlong.

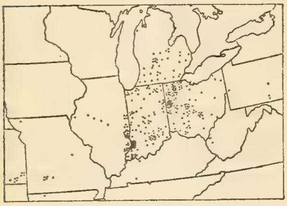


FIG. 61.—Outline map of the central United States, showing the distribution of Nigger wheat in 1919. Estimated area, 280,600 acres.

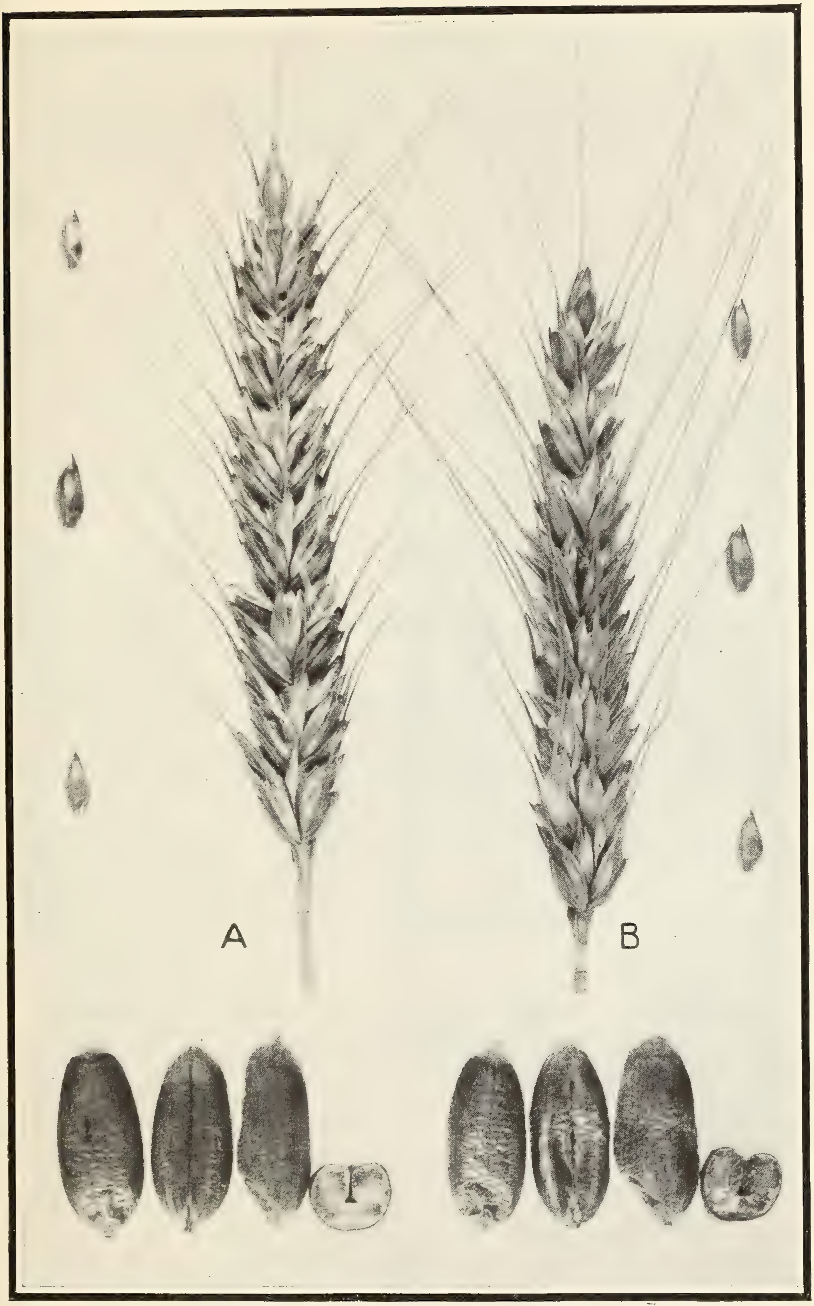
Nigger differs from Gluten and Rudy chiefly in having purple straw and shorter beaks. A spike, glumes, and kernels of Nigger are shown in Plate XLII, *B*.

History.—"Nigger wheat is said to have been first distributed from the farm of a colored man in Darke County, Ohio." (*114*, p. 4.) It was grown in experiments by the Ohio Agricultural Experiment Station as early as 1884.

Distribution.—Grown in 1919 in Arkansas, Illinois, Indiana, Kansas, Kentucky, Michigan, Missouri, Ohio, Pennsylvania, Texas, and West Virginia. This distribution is shown in Figure 61.

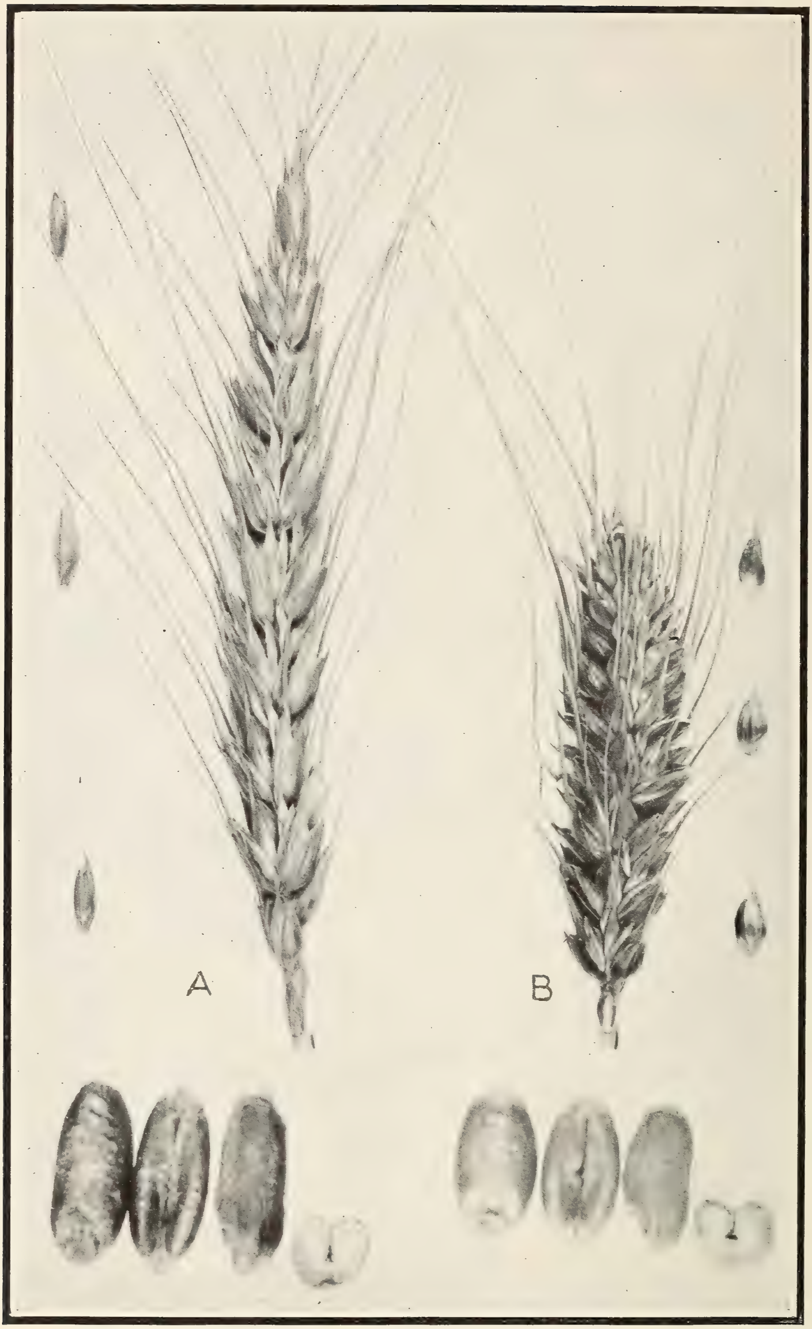
Synonyms.—Winter Green, Winter John, and Winter King.

Winter Green is the name under which a sample of Nigger wheat was obtained from St. Henry, Ohio, in 1919, where it had been grown for 10 years. Winter John is a name used for Nigger in Bartholomew County, Ind., since 1901. Winter King is the name under which a sample of Nigger was obtained from the Indiana Agricultural Experiment Station through the Cornell University station in 1912. Winter King was first obtained by the United States Department of Agriculture from J. A. Simmer's Seed House, Toronto, Ontario, Canada, in 1902. It was reported grown by the Ohio Agricultural Experiment Station as early as 1906, and by the Kentucky station in 1907. This name was reported in 1919 from Illinois, Indiana, Kentucky, Michigan, Missouri, Ohio, Pennsylvania, Tennessee, and West Virginia. Most of the wheat grown under this name is Goldcoin, Poole (Harvest King), Fulcaster, or Jones Fife (Winter Fife).



RUDY (A). NIGGER (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



SILVERSHEAF (A). GENESEE GIANT (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

SILVERSHEAF (JONES SILVER SHEAF LONGBERRY RED).

Description.—Plant winter habit, midseason, tall; stem usually white, midstrong, coarse; spike awned, fusiform, lax, inclined; glumes glabrous, white, long, midwide, easily deciduous; shoulders midwide, usually elevated; beaks 2 to 30 mm. long; awns 3 to 10 cm. long; kernels pale red, long, soft, elliptical; germ small; crease midwide, shallow to middeep; cheeks rounded; brush midsized, midlong.

The variety as grown contains mixtures of purple straw. Silversheaf is distinct in having dark coffee-colored stripes on the glumes. A spike, glumes, and kernels of Silversheaf wheat are shown in Plate XLIII, *A*.

History.—This variety was originated by A. N. Jones (*128*), Le Roy (formerly of Newark, N. Y.), Genesee County, N. Y., in 1903. Concerning it he has written the following:

> I offer this season for the first time the finest Longberry Red wheat ever known in this country. . . . This wonder in the wheat line originated from a cross between my No. 8, or better known as American Bronze, and the crossbreed from a cross between Lancaster and Seedling No. 91, Longberry.

He described the wheat as follows:

> Straw of a light yellow color, medium tall, thick walled and strong; head long, wide, and full, which as they ripen has a drooping habit. Chaff white, thin, with a silvery glisten in the sun; grain large, dark, and flinty, nearly as long as rye.

This wheat was advertised and distributed by Peter Henderson & Co. (*110*), seedsmen, of New York, as early as 1903.

Distribution.—Grown in New York and South Carolina, and under the names of synonyms in Maryland, North Carolina, Pennsylvania, and West Virginia. (Fig. 62.)

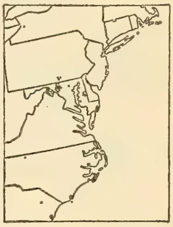


FIG. 62.—Outline map of a portion of the eastern United States, showing the distribution of Silversheaf wheat in 1919. Estimated area, 34,900 acres.

Synonyms.—Australian, Clipperd's Bearded, Coffee, and Davis.

Australian is the name under which a sample of Silversheaf was obtained from Frederick, Md., in 1919. The variety was reported under this name from Maryland and Pennsylvania. Clipperd's Bearded is the name under which a sample of Silversheaf was obtained from Chatham County, N. C., in 1919. Coffee is the name used for Silversheaf in West Virginia. A sample was obtained from Shepherdstown, W. Va., in 1919. The name Coffee is probably due to the color of the glumes. Davis is a name used for Silversheaf in Maryland and North Carolina. A sample of Davis was obtained from Lynch, Md., in 1919.

FRETES.

Description.—Plant spring habit, although very prostrate in early growth, midseason, midtall; stem white, weak to midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to elevated; beaks 2 to 20 mm. long; awns 2 to 7 cm. long; kernels pale red, long, soft, ovate, humped, pointed; germ small; crease midwide to wide, shallow to middeep; cheeks angular; brush midsized, midlong.

History.—Fretes was introduced into the United States from El Outaya, Constantine, Algeria, in 1901 (*197*, S. P. I. No. 7582) by David Fairchild and C. S. Scofield, of the United States Department of Agriculture. It is extensively grown in the oases of the Sahara Desert and is sown in November.

The variety is said to have originated from a shipment of Russian wheat which was made into Algeria at the time of a famine many years ago.

Distribution.—Fretes wheat has been grown in experiments at many stations in the drier sections of the United States, where it has proved a high-yielding, drought-resistant variety. Its weak straw largely has prevented it from becoming an important commercial variety. It was reported in 1919 from Los Angeles County, Calif., and was formerly grown to some extent in that county.

DIXON (HUMPBACK II).

Description.—Plant spring habit, late, tall; stem white, midstrong; spike awned, fusiform, lax, inclined; glumes glabrous, white, long, narrow; shoulders usually wanting; beaks wide, 3 to 10 mm. long; awns 4 to 7 cm. long; kernels pale red, midlong to long, semihard, ovate, humped; germ midsized; crease midwide, deep, sometimes pitted; cheeks rounded to angular; brush midsized, long.

This variety is distinguished by the humped kernels, the absence of shoulders on the glumes, and the wide lax spikes. The kernels have a smaller brush and germ than Humpback.

History.—The origin of Dixon is undetermined. It has been grown in Wisconsin for many years. The name Dixon is here chosen as a name for Humpback II or Smooth Humpback, as the two varieties are practically identical. The Humpback variety originated from field selections made by J. P. Berglund, a farmer living near Kensington, Minn. (*190*, p. 1). The original head was probably the result of a natural field hybrid. Two strains were developed, one with pubescent glumes and one with glabrous glumes. The glabrous-glumed strain was distributed a few years later than the pubescent strain, which was distributed about 1905.

Distribution.—Grown in Buffalo County, Wis. Humpback wheat was reported from Illinois, Minnesota, Nebraska, North Dakota, South Dakota, and Wisconsin. Replies to the questionnaires do not show which strain of Humpback wheat is grown. It is thought by the writers, however, that this glabrous strain, Dixon, is grown to a greater extent than the true Humpback. The acreage of both strains is decreasing.

Synonyms.—Humpback II, Johnson, and Smooth Humpback. The name Humpback II was first used for this glabrous-glumed strain of Humpback in 1920 (*66*, p. 7). Johnson is a wheat which contains strains practically identical with Humpback II. Johnson is fully discussed under synonyms of Preston. Smooth Humpback is the name sometimes used for this glabrous-glumed strain of Humpback wheat in order to distinguish it from the pubescent strain called Humpback or Bearded Bluestem.

CHUL.

Description.—Plant spring habit, early, short to midtall; stem white, weak, spike awned, fusiform, lax, inclined; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to apiculate; beaks 5 to 45 mm. long; awns 3 to 10 cm. long; kernels red, long, hard, ovate, tapering, humped; germ small; crease wide, shallow; cheeks angular; brush small, midlong.

Chul differs from Talimka only in having red kernels. The kernels are large, very hard, and somewhat similar to kernels of durum wheat. A spike of Chul wheat is shown in Plate VI, Figure 1.

History.—Chul was introduced into the United States in 1902 (*197*, S. P. I. No. 9131) from Russian Turkestan by the United States Department of Agriculture through E. A. Bessey. The seed was obtained from Dzhizak, a town about 100 miles northwest of Samarcand. There it is grown on the steppes without irrigation and is both fall and spring sown. The original seed was a mixture of red and white kernels, the greater part being red. The name Chul, therefore, has been continued for the red-kerneled portion. The white-kerneled types are identical with Talimka. Both types have been grown separately at experiment stations, but a part of the original introduction, which consisted of 100 pounds, was distributed to farmers. The wheat grown commercially under this name, therefore, is mostly a mixture of Chul and Talimka.

Distribution.—Chul was reported in 1919 from Lake, Siskiyou, and Yolo Counties, Calif., and Clark County, Nev.

Synonyms.—Aulieata, Idaho Hard, and Yantagbay. Aulieata (*197*, S. P. I. No. 9794) is a wheat identical with Chul introduced from Tashkent, Russian Central Asia, by E. A. Bessey, for the United States Department of Agriculture in 1903. Idaho Hard is a name reported for Chul from Siskiyou County, Calif. Yantagbay (*197*, S. P. I. No. 9791) is another wheat identical with Chul, which has the same history as Aulieata.

LINK (MISSING LINK).

Description.—Plant winter habit, late, tall; stem white, strong; spike awned, fusiform, middense, inclined; glumes glabrous, brown, midlong, midwide; shoulders midwide, oblique to square; beaks 2 to 10 mm. long; awns 3 to 7 cm. long; kernels white, midlong, soft, ovate; germ midsized; crease narrow to midwide, shallow to middeep; cheeks rounded; brush midsized, midlong to long.

History.—The origin of Link is undetermined. It was obtained as Missing Link by the United States Department of Agriculture from the Indiana Agricultural Experiment Station in 1912, which in turn obtained it from Jonas Gibson, Oakville, Ind., in 1911.

Distribution.—Grown at several experiment stations in the eastern United States and possibly commercially in Indiana, although it was not reported on the varietal survey.

EMERALD (EARLY SPRING).

Description.—Plant spring habit, midseason, midtall; stem white, slender, weak; spike awned, fusiform, middense, inclined; glumes glabrous, yellowish brown, midlong, midwide; shoulders midwide, usually oblique; beaks 1 to 3 mm. long; awns 3 to 7 cm. long; kernels white, midlong, soft to semihard, ovate; germ midsized; crease narrow to midwide, shallow; cheeks usually angular; brush midsized, short.

History.—This variety was obtained by the Nebraska Agricultural Experiment Station, Lincoln, Nebr., in 1913, from C. N. Schmale, a farmer living near Emerald, Nebr., as Early Spring wheat. Its previous history is undetermined and it is here named Emerald.

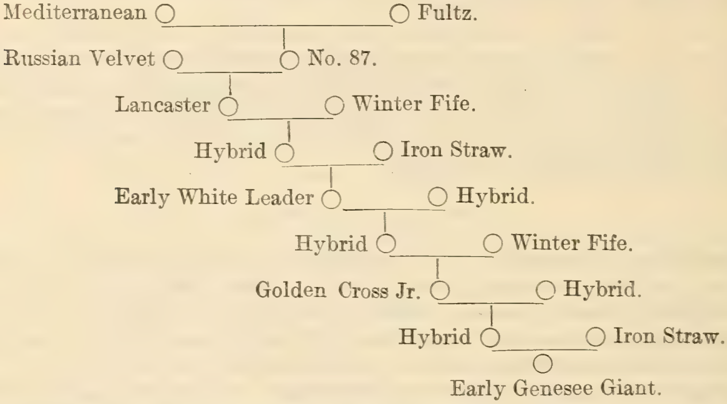
Distribution.—This variety has been grown in experiments in the State of Nebraska and has probably continued as a commercial wheat in that State, although to what extent is not known. No wheat was reported as Early Spring from Nebraska in 1919, but some white spring wheat is known to be grown in that State and this may be one of the varieties.

GENESEE GIANT (EARLY GENESEE GIANT).

Description.—Plant winter habit, midseason, midtall; stem purple, strong, stout; spike awned, clavate, dense, erect; glumes glabrous, brown, midlong, wide; shoulders narrow, usually rounded; beaks 2 to 20 mm. long; awns, 3 to 7 cm. long; kernels white, short, soft to semihard, oval; germ midsized; crease midwide, middeep; cheeks usually rounded; brush midsized, midlong; kernels produced in upper end of spikes resemble club wheat.

This variety is distinct in having a clavate spike and hard white kernels. A spike, glumes, and kernels of this variety are shown in Plate XLIII, *B*.

History.—Genesee Giant (Early Genesee Giant) was first distributed by A. N. Jones, of Newark, Wayne County, N. Y., the originator, in 1893. It was advertised by Peter Henderson & Co., seedsmen, of New York, in 1894, and described elaborately and recommended highly by them. It is the result of a composite cross which has been recorded by Carleton (*58*, p. 71), as follows:



Distribution.—Grown in Davis and Weber Counties, Utah, and experimentally in the eastern United States.

Synonyms.—Farmers Trust, Giant Squarehead, Pedigree Giant, Genesee, Golden Cross.

Farmers Trust is a local name which has recently become used for Genesee Giant in Idaho, Montana, and Nebraska. Giant Squarehead is a wheat similar to Genesee Giant obtained from the Cornell University Agricultural Experiment Station. Pedigree Giant is a wheat similar to Genesee Giant obtained from the Idaho Agricultural Experiment Station in 1912. A wheat was distributed by A. N. Jones as Pedigree Genesee Giant in 1894, the year following the distribution of Genesee Giant. This doubtless accounts for this name. It is possible that the original Genesee Giant was somewhat mixed and a pure strain was distributed later. Genesee is a shortened name used by growers in Utah. Golden Cross is the name under which a sample of wheat similar to Genesee Giant was obtained from the Indiana station through the Cornell University Agricultural Experiment Station in 1912. This name is listed for a wheat originated by A. N. Jones in 1886, heading the list of varieties which he originated, which appears on his stationery. The name Golden Cross, therefore, probably is wrongly applied to this wheat.

CANADIAN RED.

Description.—Plant spring habit, early, short; stem white, slender, weak; spike awned, oblong-fusiform, middense, inclined; glumes glabrous, brown, long, midwide; shoulders midwide, oblique to elevated; beaks 2 to 20 mm. long; awns 2 to 6 cm. long; kernels white, midlong, semihard to hard, ovate, humped, curved; germ midsized; crease middeep, shallow to middeep; cheeks rounded; brush small, short.

History.—The origin of Canadian Red is undetermined. It was obtained in July, 1919, from F. G. Stokes, of Kelseyville, Calif., who reported that it constituted 15 per cent of the wheat grown in the vicinity of Kelseyville, Lake County, Calif.

Distribution.—Grown in Lake County, Calif.

Synonym.—Canadian Spring. This name is also used for Canadian Red in Lake County, Calif.

LONGBERRY NO. 1 (JONES LONGBERRY NO. 1).

Description.—Plant winter habit, midseason, tall; stem white, midstrong; spike awned, oblong-fusiform, middense, inclined; glumes glabrous, brown, midlong, midwide; shoulders midwide, usually rounded; beaks 3 to 10 mm. long; awns 3 to 7 cm. long; kernels white, midlong to long, soft, ovate, curved; germ small to midsized; crease midwide, middeep, pitted; cheeks rounded; brush midsized, midlong to long.

History.—Longberry No. 1 was originated by A. N. Jones (*128*), at Newark, Wayne County, N. Y. Concerning its origin he has written as follows:

> This Amber Longberry wheat sent out in bulk in 1898 has proved to be one of great value in all sections. Originating from a cross seedling, parentage of which came from a cross between Mediterranean and Russian Velvet.

Distribution.—Jones Longberry was reported grown in Kentucky, Michigan, and New York. This may or may not be Longberry No. 1.

NEW AMBER LONGBERRY.

Description.—Plant winter habit, midseason to late, tall; stem purple, strong; spike awned, linear-fusiform, lax, inclined to nodding; glumes glabrous, brown, midlong, midwide; shoulders wanting to narrow, oblique; beaks 2 to 5 mm. long; awns 2 to 7 cm. long; kernels white, long, soft, elliptical; germ small to midsized; crease narrow to midwide, shallow to middeep; cheeks rounded; brush midsized, midlong to long.

This variety differs principally from Longberry No. 1 in having purple straw and a longer, laxer, and more fusiform spike.

History.—New Amber Longberry was obtained by the United States Department of Agriculture in 1899 from A. N. Jones, of Newark, N. Y., who is recorded as having originated it.

Distribution.—Grown in experiments at the Arlington Experimental Farm, near Rosslyn, Va. It is not known to be commercially grown.

SEVIER.

Description.—Plant spring habit, early, short to midtall; stem hollow, white, slender, weak to midstrong; spike awned, somewhat laterally compressed, oblong, dense, erect to inclined; glumes glabrous, brown, midlong, midwide; shoulders midwide, oblique; beaks midwide, acuminate, 1 to 3 mm. long; awns 2 to 6 cm. long; kernels white, midlong to long, semihard to hard, ovate, humped; germ midsized; crease midwide, shallow; cheeks angular; brush midsized, midlong.

This variety is not pure as commercially grown. It is very distinct and peculiar, as it represents nearly an intermediate form between common and durum wheat, and for that reason also somewhat resembles poulard wheat. It has the laterally compressed spike, sharply keeled glumes, and large, hard kernels of durum and the short, hollow stem, short awns, and midlong brush of common wheat. A spike, glumes, and kernels of Sevier are shown in Plate XLIV, *A*.

History.—The origin of Sevier wheat is undetermined. It may be the result of a natural field hybrid between common and durum wheat. It was first noted to be commercially grown in Utah by Stewart (*186*, p. 165) in the summer of 1918 and first listed as Kubanka durum wheat. Samples were obtained by the writers from Mr. Stewart and from the Federal Board of Review, Chicago, Ill., and the wheat was found not to be Kubanka and was also determined to be more nearly a common than a durum wheat. As the variety had been grown in Sevier County, Utah, for 25 years or more, it was named Sevier by Stewart (*187*, p. 25), of the Utah station.

Distribution.—Grown in Utah.

DIEHL-MEDITERRANEAN.

Description.—Plant winter habit, midseason, midtall to tall; stem white, midstrong; spike awned, fusiform, middense, inclined to nodding; glumes glabrous, brown, midlong, midwide; shoulders midwide, rounded to oblique to elevated; beaks 1 to 8 mm. long; awns 3 to 7 cm. long; kernels pale red, midlong, soft, ovate to elliptical; germ midsized; crease narrow to midwide, middeep; cheeks usually rounded; brush midsized, midlong to long.

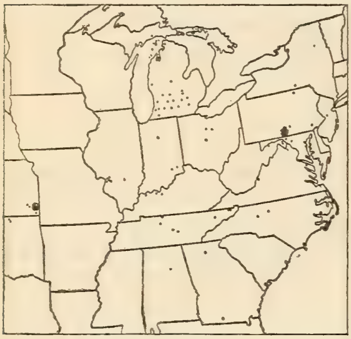


FIG. 63.—Outline map of a portion of the United States, showing the distribution of Diehl-Mediterranean wheat in 1919. Estimated area, 114,700 acres.

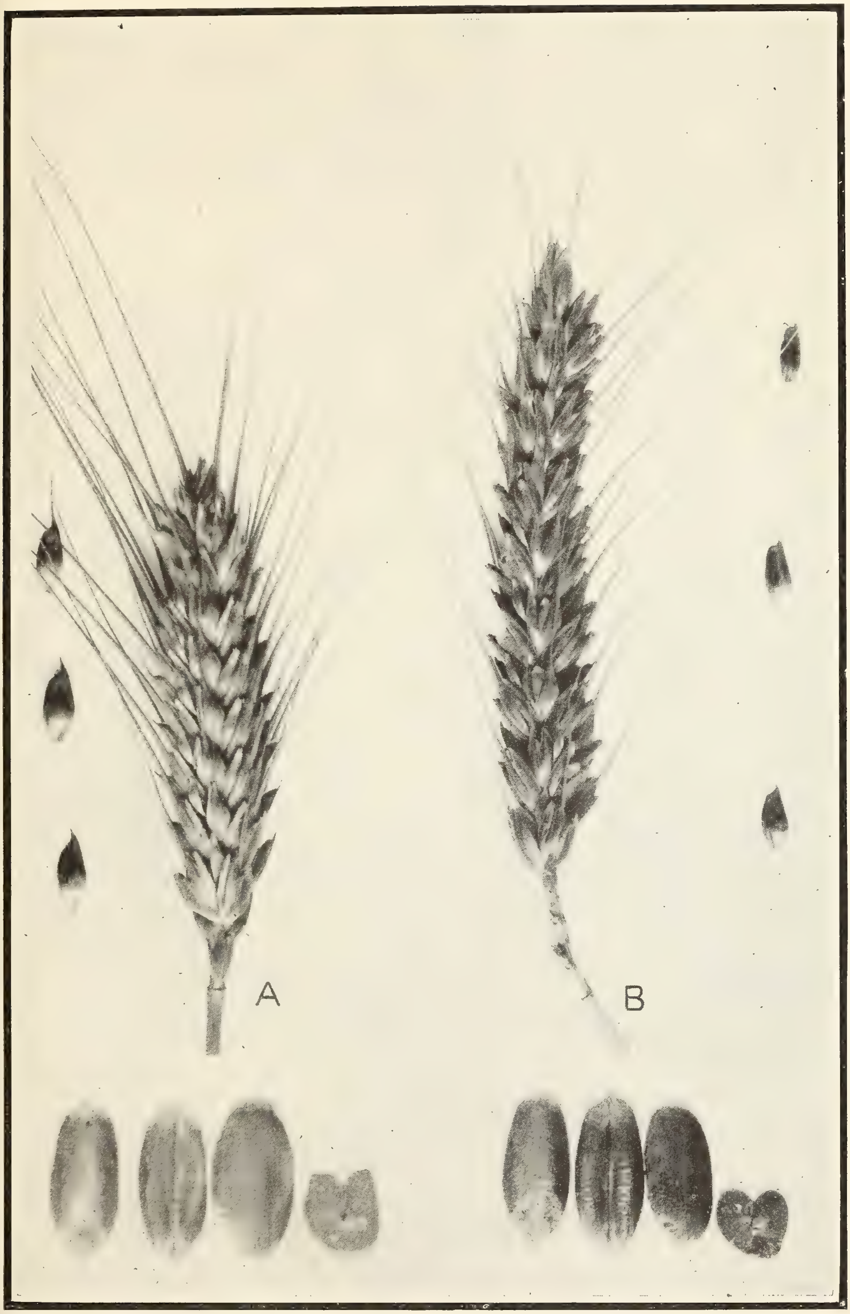
Diehl-Mediterranean differs from Mediterranean principally in having white straw and a smaller kernel. A spike, glumes, and kernels of Diehl-Mediterranean wheat are shown in Plate XLV, *A*.

History.—The Diehl-Mediterranean was advertised and distributed by Peter Henderson & Co., seedsmen, of New York City, for the first time in 1884, and is said by them to have originated by fertilizing the Red Mediterranean with the pollen of the Diehl (*110*, 1884). The same history is given in an article in the Rural New Yorker of the same year, in which it is also said that the variety originated in Monroe County, N. Y., but by whom was not noted (*18*). The Diehl wheat was a white-kerneled wheat with a clavate spike, probably similar to Seneca Chief. During the late eighties the Diehl-Mediterranean was distributed widely by the United States Department of Agriculture in the congressional seed distribution.

Distribution.—Grown as Diehl-Mediterranean in Michigan, New York, and Pennsylvania, and under the name of synonyms in Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Oklahoma, Tennessee, Virginia, and West Virginia. This distribution is shown in Figure 63.

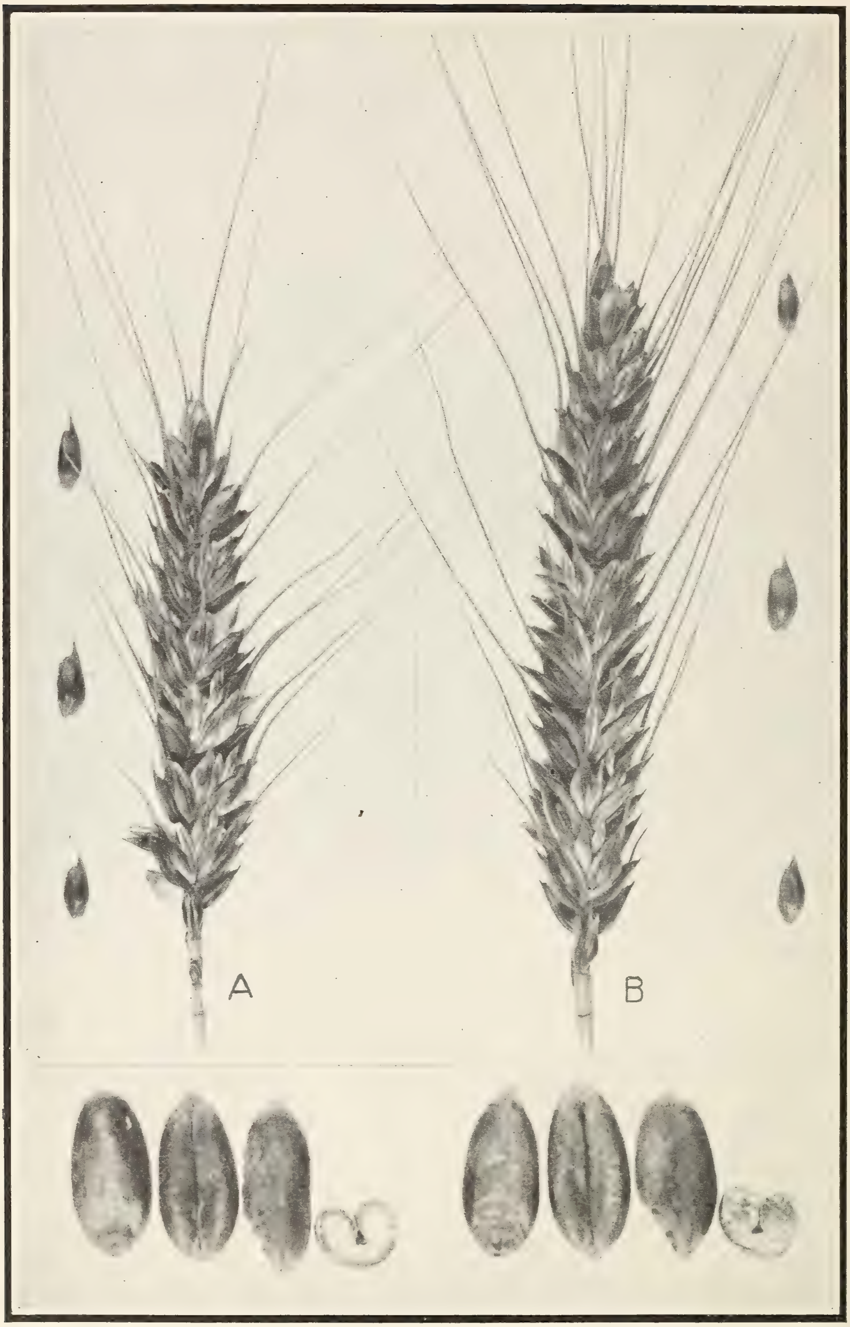
Synonyms.—Auburn, Big Four, Big Ten, Blue Ridge, Eclipse, Hybrid Mediterranean, Michigan Bronze, Michigan Brown, Miller's Choice, Rattle Jack, Russian Amber, Shepherd's Perfection, Shepherd's Prolific, and Spade.

Auburn is the name under which a wheat identical with Diehl-Mediterranean was obtained from the Virginia Agricultural Experiment Station in 1917. It is not known to be commercially grown. Big Four, which also was found to be identical with Diehl-Mediterranean, was obtained from A. J. Hagman, of Hawesville, Hancock County, Ky., who stated that it had been grown for eight years in that vicinity, where it constitutes 33 per cent of the wheat acreage. It also is grown in Cass County, Ind. Big Ten also is Diehl-Mediterranean, as grown in Ripley County, Ind., and Henderson County, Ky. Blue Ridge is a name under which samples of wheat similar to Diehl-Mediterranean have been obtained from the Kentucky and Virginia stations. Its further history is undetermined. Blue Ridge was reported in 1919 from North Carolina, New Jersey,



SEVIER (A). LADOGA (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



DIEHL-MEDITERRANEAN (A). GOENS (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

and Pennsylvania. Eclipse is a wheat similar to Diehl-Mediterranean, except that sometimes it has a slightly elevated shoulder. This wheat was first obtained by the United States Department of Agriculture from T. W. Wood & Sons, seedsmen, of Richmond, Va., in 1899. Its previous history is undetermined. Eclipse was reported from Ohio, Tennessee, Virginia, and West Virginia. Hybrid Mediterranean is a name early used for Diehl-Mediterranean wheat and often is referred to in literature as a synonym of that variety.

Michigan Bronze is a name which was recognized as a synonym of Diehl-Mediterranean wheat by the Ohio Agricultural Experiment Station as early as 1888. It apparently is a name under which Diehl-Mediterranean wheat was advertised and distributed by Thorburn & Co., seedsmen, of New York City, as early as 1889. The name, however, was recorded for a wheat by C. S. Plumb as early as 1877. It was reported from Michigan and Tennessee in 1919. Michigan Brown apparently is a name used by some growers of Michigan Bronze.

Miller's Choice apparently is identical with Diehl-Mediterranean. It has been grown by the North Carolina Agricultural Experiment Station, but was not reported in the varietal survey. According to Prof. G. M. Garren, of North Carolina station, the wheat now called Miller's Choice was bought as seed wheat by B. B. Miller, of Salisbury, N. C., from some one in Maryland, who called it " Spade " wheat. It was tried on Mr. Miller's place and later on the Iredell Farm of the North Carolina station at Statesville, N. C., and did well in each place. As the name " Spade " was not familiar to these men, it was rechristened " Miller's Choice," in honor of Mr. Miller.

Rattle Jack is the same as Diehl-Mediterranean and is the principal variety grown in Crawford County, Kans. It also is grown in Cherokee and Neosho Counties, Kans., and Osage County, Okla. It was also reported from Madison and Marion Counties, Ill., but according to Leighty the wheat there grown as Rattle Jack is of Gipsy type. Its history is undetermined. Russian Amber is a name under which samples of wheat identical with Diehl-Mediterranean have been received from the Indiana Agricultural Experiment Station. Its history is undetermined and it is not known to be commercially grown. Shepherd's Perfection grown in 14 counties in Michigan is for the most part Diehl-Mediterranean. One sample obtained from Ceresco, Calhoun County, proved to be Goens. Shepherd's Prolific is a name under which a sample identical with Diehl-Mediterranean was obtained from the Indiana Agricultural Experiment Station. It was reported from Jennings County, Ind., and Delaware and Richland Counties, Ohio. Spade is identical with Diehl-Mediterranean. The origin of the name Spade is undetermined. Wheat under that name was first obtained by the United States Department of Agriculture from Pennsylvania in 1903. It was reported from Georgia, Kentucky, Maryland, North Carolina, Ohio, Pennsylvania, Tennessee, and Virginia.

RUSSIAN.

Description.—Plant winter habit, late, midtall; stem white, strong; spike awned, fusiform, middense, inclined; glumes glabrous, brown, midlong, narrow; shoulders wanting to narrow, elevated; beaks 2 to 10 mm. long; awns 3 to 7 cm. long; sometimes black; kernels red, midlong, semihard, ovate to elliptical, acute; germ small; crease midwide, shallow to middeep; cheeks rounded to angular; brush midsized, midlong to long.

Russian differs from Diehl-Mediterranean principally in being later and shorter and in having narrower and darker colored glumes and, under some conditions, black awns.

History.—The above-described sample under the name of Russian was obtained from the Virginia Agricultural Experiment Station, Blacksburg, Va., in 1917. Its origin is undetermined. It is slightly different from Russian Amber listed above as a synonym of Diehl-Mediterranean, and also is different from any other wheat grown in the United States under the name of Russian.

Distribution.—Wheat under the name Russian was reported in 1919 from Maryland, Michigan, Missouri, Ohio, Tennessee, and Virginia. This may or may not be the wheat above described.

IMPERIAL AMBER.

Description.—Plant winter habit, midseason, midtall; stem usually white, sometimes faintly purple on lower internodes, midstrong; spike awned, broadly fusiform, middense, inclined; glumes glabrous, brown, long, wide; shoulders wanting to narrow, oblique; beaks 3 to 25 mm. long; awns 2 to 8 cm. long; kernels red, midlong, soft, ovate to elliptical; germ small to midsized; crease midwide, middeep to deep, pitted; cheeks usually rounded; brush midsized, midlong.

Imperial Amber differs from Diehl-Mediterranean principally in having longer glumes and beaks.

History.—The origin of Imperial Amber is undetermined. Several samples have been obtained from the Missouri and Indiana Agricultural Experiment Stations. The samples have varied slightly in length of beak and other minor characters. The strain above described is a pure-line selection (C. I. No. 5338) made by Dr. C. E. Leighty at the Arlington Experimental Farm from a bulk sample obtained from the Missouri Agricultural Experiment Station in 1913.

Distribution.—No wheat is known to be grown commercially under the name Imperial Amber. The unselected wheat under this name, which probably may be only Diehl-Mediterranean, has been grown in experiments in Missouri, Indiana, Ohio, and New York, and the pure-line strain above described is grown at Arlington Farm.

Synonyms.—Davidson and Farmers Trust. A sample of wheat called Davidson was obtained from the Virginia Agricultural Experiment Station in 1917 and proved to be very similar to Imperial. The origin of Davidson is undetermined and it is not known to be commercially grown. Farmers Trust is a name under which a sample similar to Imperial was obtained from the Cornell University Station. This name is applied to at least two other varieties. It probably is most commonly used for Mediterranean. The name was reported for wheat grown in Arkansas, Indiana, Michigan, Pennsylvania, and Wisconsin.

GOENS.

Description.—Plant winter habit, early, midtall to tall; stem purple, strong; spike awned, fusiform, middense, inclined; glumes glabrous, brown, midlong to long, midwide, easily deciduous; shoulders narrow, usually oblique; beaks 1 to 3 mm. long; awns 2 to 7 cm. long; kernels red, midlong, soft, ovate; germ midsized to large; crease midwide, middeep to deep, sometimes pitted; cheeks usually rounded; brush midsized, midlong.

Goens differs from Diehl-Mediterranean principally in being earlier and in having purple straw, more easily shattered spikes, and shorter beaks. A spike, glumes, and kernels of Goens are shown in Plate XLV, *B*.

History.—The Goens variety, under the names Red Chaff and Red Chaff Bearded, has long been known in the United States. According to Klippart, in 1857 (*131*, p. 739) this wheat was "cultivated in Clermont County, Ohio, for upward of 50 years." He further states that the origin of the name Goens is undetermined. Wheat under this name was first obtained by the United States

Department of Agriculture in 1912 from the Indiana Agricultural Experiment Station, through Cornell University. It "was introduced into Muskingum County (Ohio) by John Dent in 1808." The Red Chaff wheat mentioned above, however, may be only the Mediterranean variety, as Goens has been said to be a cross between Mediterranean and Gipsy made by a man named Goens in Ohio and afterwards developed by his son. Concerning the introduction of the variety into Shelby County, Ind., where it now is the leading variety, Russell G. East, county agent, Shelbyville, Ind., has written as follows:[25]

> Answering your inquiry regarding Shelby Red Chaff wheat. The year 1887 a man named Hall living at Fountaintown, in this county, purchased a carload of seed wheat in Paulding County, Ohio. From this start this variety has become the common variety grown throughout the county and has been known locally as Hall, Red Hall, Red Chaff, and Red Chaff Bearded.

Distribution.—Grown as Goens in Indiana, Michigan, and Ohio, and under the names of synonyms in Illinois and Pennsylvania. (Fig. 64.)

Synonyms.—Baldwin, Cummings, Dunlap, Dunlop, Going, Hall, Miller's Pride, Owen, Red Chaff, Red Chaff Bearded, Red Hall, and Shelby Red Chaff. The name Baldwin is used locally for Goens wheat in Madison, Pickaway, and Union Counties, Ohio. Cummings is the name of a wheat apparently identical with Goens which was reported grown for two years in the vicinity of Tippecanoe City, Miami County, Ohio, and constitutes 50 per cent of the wheat of that vicinity, according to C. A. Studebaker, of that place. Dunlap is the name under which a sample of wheat identical with Goens was obtained from the Indiana Agricultural Experiment Station in 1913. It is grown in Indiana, Ohio, and Pennsylvania as Dunlap or Dunlop. In Fayette and Rush Counties, Ind., it is extensively grown. The names Going and Owen are commonly used on Ohio farms for Goens. Hall and Red Hall are names used for a wheat identical with Goens in Indiana, particularly in Hancock and Shelby Counties, where it is extensively grown and where it has been grown for 10 to 15 years. According to J. E. Barrett, of Fortville, Ind., the variety was named Hall for J. M. Hall, the man who first took the wheat into Hancock County. Miller's Pride also is identical with Goens and is grown in Berks County, Pa. A sample of this wheat was first obtained by the United States Department of Agriculture in 1912 from Cornell University, which in turn obtained it from the Indiana station. Red Chaff and Red Chaff Bearded, as indicated above, are old names now most commonly used for Goens wheat in Indiana, Ohio, and Illinois. Red Chaff was reported from several other States, but as this name is used also for other varieties, the distribution of Goens wheat as Red Chaff can not be definitely determined. Shelby Red Chaff is the name adopted by the farm bureau executive board of Shelby County, Ind.

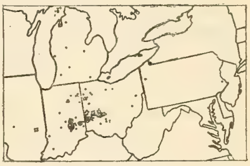


FIG. 64.—Outline map of a portion of the eastern United States, showing the distribution of Goens wheat in 1919. Estimated area, 132,600 acres.

COX.

Description.—Plant winter habit, late, midtall; stem purple, midstrong; spike awned, oblong to clavate, dense, inclined to nodding; glumes glabrous, brown, midlong, midwide; shoulders narrow, oblique to square; beaks 1 to 10 mm. long; awns 3 to 6 cm. long; kernels red, midlong, soft, ovate to oval to elliptical; germ midsized; crease narrow, middeep; cheeks usually rounded; brush midsized, midlong.

Cox differs principally from Goens in having an oblong to clavate spike and longer beaks.

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[25] Correspondence of the Office of Cereal Investigations, Mar. 1, 1922.

History.—A sample of this wheat was first obtained by the United States Department of Agriculture from a Mr. Ruppe, of Pendleton, Oreg., in 1900, at which time the wheat evidently was a commercial variety in that vicinity. Recent samples have been obtained from Hustis A. Miller, of Lexington, Morrow County, Oreg., who states that it has been grown in that county since about 1906. Its previous history is undetermined.

Synonym.—Cox Red Crown. This name was used by Hyslop (*126*, p. 674) in referring to the Cox variety.

Distribution.—Cox wheat was reported in 1919 from Morrow and Umatilla Counties, Oreg.

YAROSLAV.

Description.—Plant winter habit, late, midtall to tall; stem purple, midstrong, slender; spike awned, fusiform, middense, inclined to nodding; glumes glabrous, brown, sometimes striped with black, short, narrow; shoulders midwide, usually rounded; beaks 1 to 3 mm. long; awns 3 to 7 cm. long, sometimes black; kernels red, midlong, semihard to hard, narrowly ovate; germ small; crease narrow to midwide, shallow to middeep; cheeks usually rounded; brush small, midlong.

Yaroslav somewhat resembles Turkey, but differs principally from it in having brown glumes and softer kernels.

History.—Yaroslav wheat was introduced into the United States in 1899 from Russia by M. A. Carleton (*59*, p. 20) for the United States Department of Agriculture. This wheat was obtained in two localities in the Governments of Yaroslav and St. Petersburg (*197*, S. P. I. Nos. 2791 and 2792.) It was reported to have been very winter hardy in Russia, and it was introduced for the object of replacing spring wheat in Iowa, northern Nebraska, and South Dakota. The wheat evidently did not prove winter hardy in that section of the United States.

Distribution.—Grown in experiments by the Colorado Agricultural Experiment Station at Fort Collins, Colo. It is not known to be commercially grown, except as occasional mixtures in Turkey and other Crimean wheats.

HURON.

Description.—Plant spring habit, midseason, midtall; stem white, slender, midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, brown, short, narrow; shoulders midwide, oblique to square; beaks 1 to 3 mm. long; awns 3 to 8 cm. long; kernels red, usually short, semihard to hard, ovate, acute; germ small to midsized; crease narrow to midwide, shallow; cheeks usually rounded; brush small, short to midlong.

History.—Huron wheat resulted from the progeny of a cross made in 1888 between White Fife and Ladoga, at the Central Experimental Farm, Ottawa, Canada. The cross was made by A. C. Saunders under the direction of his father, Dr. William Saunders, Dominion cerealist (*50*, p. 149). The Huron variety was first entered in the varietal experiments at Indian Head, Saskatchewan, in 1894.

Distribution.—Grown in experiments in North Dakota, South Dakota, and Montana. It is not known to be commercially grown in the United States, but is grown to a small extent in the Prairie Provinces of Canada.

NORKA.

Description.—Plant spring habit, midseason, midtall; stem white, weak to midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, brown, midlong, midwide; shoulders midwide, oblique to elevated; beaks 3 to 25 mm. long; awns 3 to 8 cm. long; kernels red, short to midlong, hard, ovate, acute; germ small to midsized; crease narrow to midwide, shallow; cheeks usually angular; brush small; short to midlong.

History.—The Norka variety originated from a pure-line selection of common wheat separated from a plat of Kubanka durum wheat in 1908 by W. G. Shelley, then a representative of the United States Department of Agriculture, at Akron, Colo. The name is the reverse spelling of Akron (*66*, p. 7).

Distribution.—Grown in experiments in Colorado, Wyoming, North Dakota, South Dakota, and Montana. It is not commercially grown.

LADOGA.

Description.—Plant spring habit, early to midseason, midtall; stem faintly purple on lower internodes, midstrong; spike awned, fusiform, middense, inclined to nodding; glumes glabrous, brown, short to midlong, narrow; shoulders narrow, usually rounded; beaks variable; awns 2 to 9 cm. long; kernels red, midlong, hard, ovate; germ midsized; crease midwide, middeep; cheeks usually angular; brush small, midlong.

All commercial samples of Ladoga wheat are variable in beak length, as stated above, ranging from 1 to 5 mm. to as long as 3 to 25 mm. in length. A pure-line selection obtained from Dr. C. E. Saunders, of Ottawa, Canada, has beaks only 1 to 2 mm. long. A spike, glumes, and kernels of Ladoga are shown in Plate XLIV, *B*.

History.—Ladoga wheat was introduced into Canada from Russia, where it was grown in latitude 60° N., near Lake Ladoga, north of Petrograd, about 1888. It was sent by the Canadian Department of Agriculture to several hundred farmers in northwestern Canada from 1888 to 1893, in the hope that it would provide a wheat ripening about 10 days earlier than Red Fife (*168*). By 1893, milling tests of the variety had shown that it was of poor milling quality, and after that time the further distribution of the variety was not encouraged.

Distribution.—Grown commercially in the United States, but only under the name Spring Turkey, in Colorado, Kansas, Montana, Nebraska, and Wyoming.

Synonyms.—Bastard and Spring Turkey. Bastard is the name applied to a wheat apparently identical with Ladoga, which is commonly found mixed in varieties of hard spring wheat in North Dakota and Montana. This mixture is thought by the authors to be remnants of Ladoga wheat which came down from Canada during the early years of wheat production in these northwestern States. Spring Turkey is the name used for wheat apparently identical with Ladoga, which is grown both as mixtures and pure in Montana and Wyoming. The authors are of the opinion that this is the Ladoga variety. Spring Turkey was reported in 1919 from Colorado, Kansas, Montana, Nebraska, and Wyoming.

LARAMIE.

Description.—Laramie is similar to Ladoga, except that it has weaker straw, an elevated shoulder, and beaks 2 to 20 mm. long.

History.—Laramie is the result of a pure-line selection from the commercial wheat grown in Wyoming as Spring Turkey. The selection was made by J. W. Jones, a representative of the United States Department of Agriculture at the Cheyenne Experiment Farm, Archer, Wyo., in 1914. The wheat was named for Laramie County, Wyo. (*66*, p. 7).

Distribution.—The Laramie variety is grown in experiments in Colorado, Montana, South Dakota, and Wyoming, but is not commercially grown.

ARIETTE.

Description.—Plant winter habit, midseason, midtall; stem white, midstrong; spike awned, fusiform, lax, inclined to nodding; glumes glabrous, brown, midlong, midwide; shoulders midwide, oblique to elevated; beaks 1 to 10 mm. long; awns 2 to 10 cm. long; kernels red, midlong to long, usually semihard, ovate; germ midsized; crease midwide, middeep; cheeks angular; brush midsized, midlong.

History.—Ariette presumably is of Italian origin. It was obtained by the Portland Seed Co. from Italians in the vicinity of Portland, Oreg., who claim to have introduced it from Italy, where it is known as Ariette.

Distribution.—Said by the Portland Seed Co. to be grown in the vicinity of Portland, Oreg. They sold seed of the variety for a number of years.

Synonyms—Aulieata. This is the name under which the Portland Seed Co. sold seed of the Ariette variety in 1919. They submitted a sample of the wheat to the Oregon Agricultural Experiment Station for identification and were informed that it probably was Aulieata. They, therefore, advertised it under that name in 1919. It was later determined, however, that it was not Aulieata.

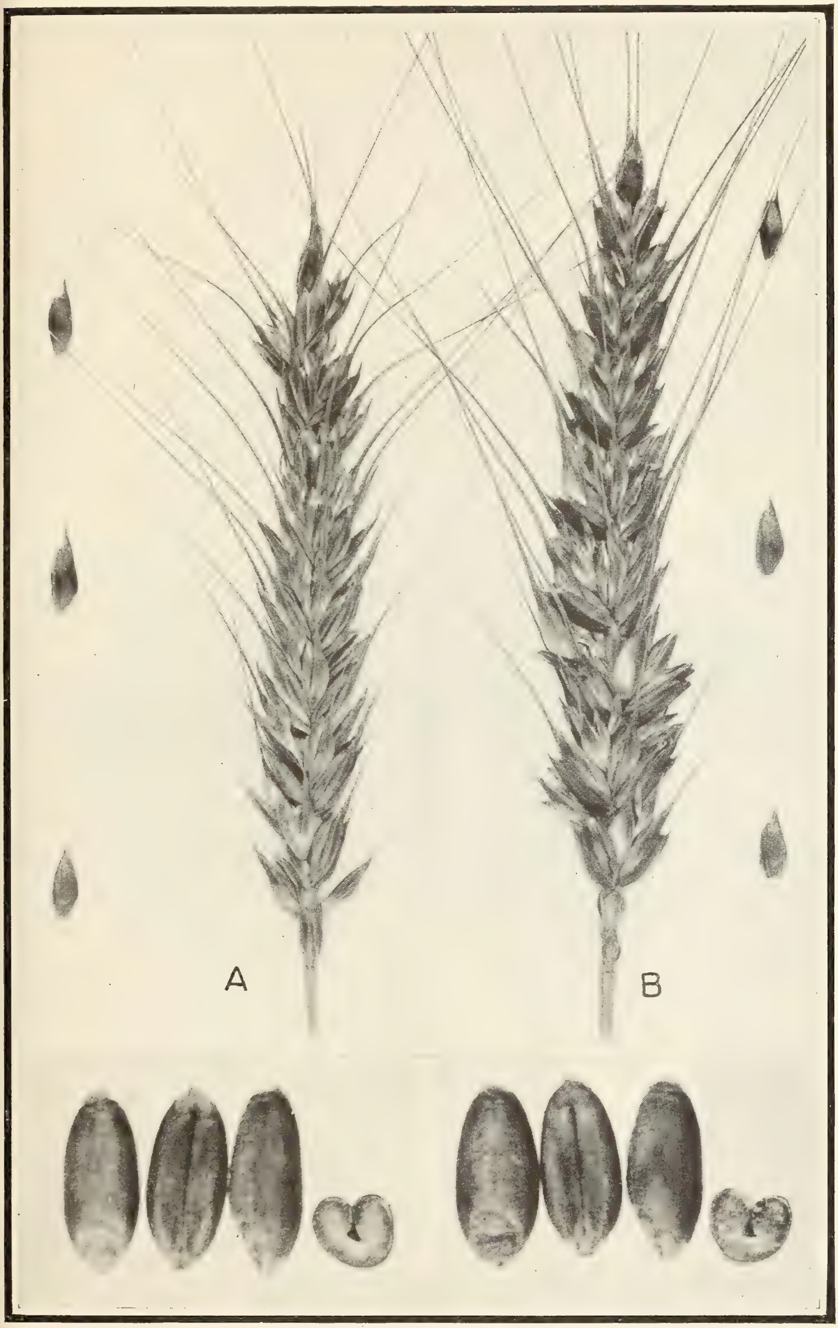
MEDITERRANEAN.

Description.—Plant winter habit, midseason, tall; stem purple, midstrong, coarse; spike awned, fusiform, middense, erect to inclined; glumes glabrous, brown, long, midwide, easily deciduous; shoulders wanting to narrow, oblique; beaks 1 to 8 mm. long; awns 3 to 7 cm. long; kernels red, long, soft, elliptical; germ midsized; crease midwide, middeep; cheeks rounded; brush midsized, midlong.

A spike, glumes, and kernels of Mediterranean are shown in Plate XLVI, *A*.

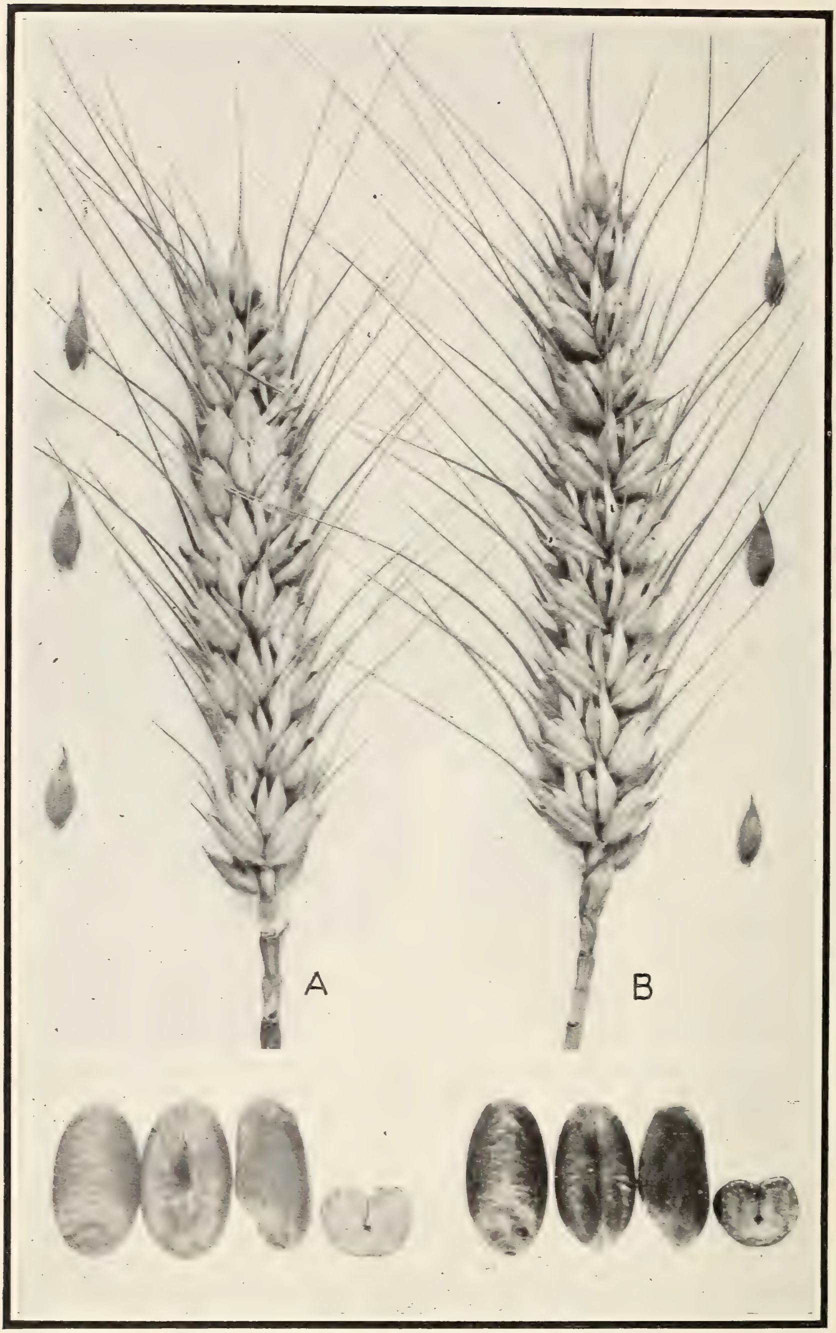
History.—Reference to the Mediterranean variety in American literature begins in 1842, when the variety was widely grown, with the statement that it had been introduced some years before. One writer says (*103*, p. 228) it was introduced into Maryland from the Mediterranean Sea region in 1837. In 1863 it was recorded (*141*, p. 501) that it was introduced in 1819 from Genoa, Italy, by John Gordon, of Wilmington, Del. It came into prominence in New York between 1845 and 1855, from which time its culture spread rapidly westward. Its early popularity apparently was gained because it was more resistant to Hessian fly damage than other varieties. It was found also to be several days earlier than the commonly grown winter wheats, such as the Flint, Bluestem, Red Bluestem, Golden Straw, and other wheats grown at that time. It was called rust resistant probably because of its earliness, and was commended as a high yielder of especially heavy grain and adapted to poorer soils than most varieties. White wheats being the standard, it was vigorously criticized, especially by millers, because its red kernels yielded a dark flour and because of the thickness of the bran. This disapproval persisted for at least 25 years, but after the introduction of roller mills it became recognized as a good milling wheat. In the earlier years it became known under many different names, as Bearded Mediterranean, Red Mediterranean, and Red Chaff Mediterranean, to distinguish it from other and different varieties to which the name Mediterranean became attached. Other synonyms were Columbian and Quaker in Pennsylvania and German in Maryland. These names apparently now have gone out of use. This early confusion in names probably was the result of repeated introductions.

Distribution.—Grown in Alabama, Arkansas, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Missis-



MEDITERRANEAN (A). RED ROCK (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



READ (A). RURAL NEW YORKER NO. 57 (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

sippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, Tennessee, Texas, Virginia, and West Virginia. This distribution is shown in Figure 65.

Synonyms.—Acme, Bluestem, Farmers Trust, Great Western, Key's Prolific, Lancaster Red, Lehigh, Miller, Miller's Pride, Missouri Bluestem, Mortgage Lifter, Red Chaff, Red Sea, Red Top, Rocky Mountain, Standby, and Swamp.

Acme is a name reported for Mediterranean wheat from Pennsylvania. Bluestem is a name commonly used by farmers in the eastern United States for Mediterranean, as well as for several other wheat varieties. Farmers Trust is a name which has been used in the central United States for Mediterranean wheat during the last 15 or 20 years. It was reported from Arkansas, Indiana, Michigan, Pennsylvania, and Wisconsin. Great Western was reported from Virginia for Mediterranean. Key's Prolific is a name used for Mediterranean in Harford County, Md. Lehigh is a name which has been used for Mediterranean wheat for about 20 years, but which evidently is no longer used by growers. It is still grown under this name by some experiment stations. Lancaster Red was reported by Dietz in 1869 (*6*, p. 178) as "a variety of the Red Chaff Bearded Mediterranean. It was obtained by selecting from the field in Lancaster County, Pa."

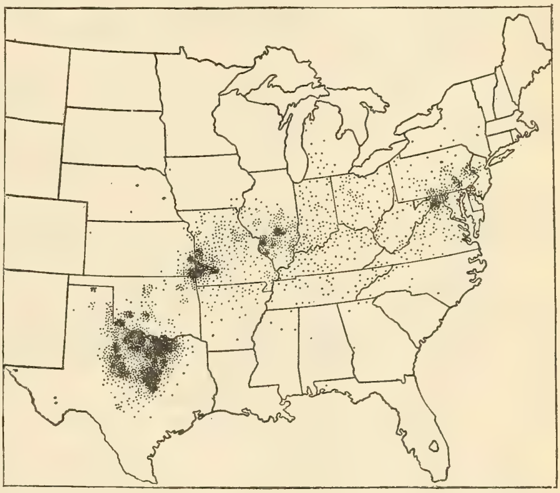


Fig. 65.—Outline map of the eastern United States, showing the distribution of Mediterranean wheat in 1919. Estimated area, 2,558,900 acres.

Miller is a name used for Mediterranean in Frederick County, Md. Miller's Pride is the name under which several samples of Mediterranean wheat have been received from the Indiana Agricultural Experiment Station. Its previous history is not determined. It was reported from Berks County, Pa. Missouri Bluestem is the name under which a wheat similar to Mediterranean, except for slightly shorter spikes, has been grown at the Arlington Experimental Farm, Va., and College Park, Md., for a number of years. The original seed was obtained from Stamford, Conn., in 1899. It is not known to be commercially grown. Mortgage Lifter is a name used for Mediterranean in Center County, Pa. Red Chaff is a name commonly used for Mediterranean as well as several other varieties of wheat. The distribution of Mediterranean under the name Red Chaff, therefore, can not be definitely determined. Red Sea is a name long used for Mediterranean wheat. How and when its use became established is not known. It was reported in 1919 from Arkansas, Illinois, Kansas, Missouri, Oklahoma, Rhode Island, Tennessee, and Texas. Red Top is a name used for Mediterranean in Oklahoma.

Rocky Mountain is the name under which a wheat identical with Mediterranean, except for a slightly shorter spike, has been grown at the Federal and

State experiment stations, at Arlington Farm, Va., and College Park, Md., since 1908. The original sample is of Maryland origin, obtained about 1900. Apparently the name Rocky Mountain was in use at that time for Mediterranean wheat. It was reported in 1919 from Illinois, North Carolina, Pennsylvania, Tennessee, and Virginia. Standby is a name used for Mediterranean in West Virginia. Swamp is a name commonly used, particularly in Indiana, for Mediterranean wheat. It was advertised by J. A. Everitt's Seed Store, of Indianapolis, Ind., in their fall catalogue of 1899, and probably was distributed for several years previous to that time. It was reported in 1919 from Illinois, Indiana, Kentucky, Ohio, Tennessee, and West Virginia.

RED ROCK.

Description.—Red Rock is similar to Mediterranean except for a slightly longer, wider, and laxer spike and a harder kernel which has a wider and deeper crease. It also yields better and is superior to Mediterranean for milling and bread making.

A spike, glumes, and kernels of Red Rock are shown in Plate XLVI, *B.*

History.—Red Rock was originated at the Michigan Agricultural Experiment Station, Lansing, Mich., from an individual kernel picked out of a white wheat called Plymouth Rock. The selection was first sown in the fall of 1908. By 1914, 60 bushels were sent out by the experiment station to as many farmers, 1 bushel being furnished each farmer. In 1915, 69 bushels were distributed in the same way. It is estimated that in the fall of 1915, 1,000 bushels of Red Rock wheat were sown in the various parts of the State of Michigan (*184*, p. 3).

Distribution.—Reported in 1919 from 68 counties in Michigan and from Connecticut, Illinois, Indiana, and Ohio. (Fig. 66.)

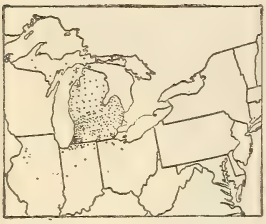


FIG. 66.—Outline map of a portion of the northern United States, showing the distribution of Red Rock wheat in 1919. Estimated area, 216,000 acres.

BEARDED WINTER FIFE.

Description.—Plant winter habit, midseason, midtall; stem white, strong, stout; spike awned, oblong-fusiform, middense, nodding; glumes pubescent, white, midlong, midwide; shoulders midwide, usually square; beaks 2 to 10 mm. long; awns 3 to 7 cm. long; kernels white, midlong, soft, broadly ovate; germ small to midsized; crease midwide, middeep; cheeks rounded; brush large, midlong.

History.—Bearded Winter Fife was originated by A. N. Jones,[26] of Newark, N. Y., in 1894, and, according to Carleton (*61*, p. 221), it is of hybrid origin and has Jones Fife as one parent. The Bearded Winter Fife was first distributed in 1896 by Peter Henderson & Co., seedsmen, of New York City.

Distribution.—Grown at experiment stations in the eastern United States. It is also probably commercially grown to a small extent, but as it has become so confused with other varieties, a definite distribution can not be reported.

READ (READ'S VERMONT WINTER).

Description.—Plant winter habit, midseason, short; stem white, strong, stout; spike awned, clavate, dense, inclined; glumes pubescent, white, long, wide; shoulders narrow, oblique; beaks 2 to 10 mm. long; awns 2 to 5 cm.

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[26] Printed stationery of Mr. A. N. Jones.

long; kernels white, midlong, soft, broadly ovate to oval; germ large; crease narrow, middeep, pitted; cheeks rounded; brush large, midlong to long.

Read differs principally from Bearded Winter Fife in being shorter and in having a distinctly clavate spike. A spike, glumes, and kernels of Read wheat are shown in Plate XLVII, *A*.

History.—Read (Read's Vermont Winter) was developed and named by Mr. G. A. Read, of Charlotte, Vt., who recorded the history as follows:[27]

> This wheat was originated by me in 1898 by crossing the Bearded Fife with a valuable early club-head beardless velvet-chaff variety found mixed with Bearded Fife and presumably Early Arcadian.

Distribution.—Grown in Ashland County, Ohio, where it constitutes about 5 per cent of the wheat grown in the vicinity of New London.

RURAL NEW YORKER NO. 57.

Description.—Plant winter habit, midseason, midtall to tall; stem white, strong, stout; spike awned, fusiform, middense, nodding; glumes pubescent, white, long, midwide; shoulders narrow, usually oblique; beaks 2 to 15 mm. long; awns 3 to 7 cm. long; kernels red, midlong, soft to semihard, ovate to oval; germ midsized; crease usually wide, middeep to deep; cheeks usually rounded; brush large, midlong.

A spike, glumes, and kernels of Rural New Yorker No. 57 are shown in Plate XLVII, *B*.

History.—The following quotation from the Rural New Yorker, in 1894 (*25*, p. 634), shows the origin of this variety:

> Peter Henderson & Co., of this city, now offer for the first time two of our wheats which the firm has kindly named "Rural New Yorker No. 57" and "Rural New Yorker No. 6." The first, of which an excellent portrait is presented in Figure 166, p. 631, is a heavily bearded variety, the parentage of which is one of our crossbred varieties fertilized with a cross breed of Velvet Chaff.

Further information concerning the origin of the variety is given by Peter Henderson & Co., in their 1895 catalogue, as follows:

> Rural New Yorker No. 57 is the result of upwards of 20 years of thoroughly scientific crossing and careful selection at the hands of Mr. E. S. Carman, editor of the Rural New Yorker and raiser of many of the most valuable agricultural introductions of recent years.

A simplification of the name Rural New Yorker No. 57 would be made here if the variety had not already practically passed out of cultivation.

Distribution.—Rural New Yorker No. 57 is grown at several experiment stations in the eastern United States and probably is grown commercially to a small extent, although this is not definitely known.

Synonym.—Velvet Chaff. This name has been used for wheat identical with Rural New Yorker No. 57, as well as for several other varieties. It is quite possible that a wheat of this type was commercially grown in the eastern United States many years before the origin of Rural New Yorker No. 57. A sample called Velvet Chaff obtained from the West Virginia Agricultural Experiment Station in 1917 proved to be similar to Rural New Yorker No. 57, except in having faintly purple straw. The previous history of this sample is undetermined.

PRIDE OF GENESEE.

Description.—Pride of Genesee is similar to Rural New Yorker No. 57, except that the beaks are slightly longer and the kernels slightly wider.

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[27] Printed circular by G. A. Read.

History.—Pride of Genesee was originated by A. N. Jones,[28] of Newark, Wayne County, N. Y., in 1893. Whether or not it is of hybrid origin is not known.

Distribution.—Grown in Monroe County, N. Y.

VIRGINIA.

Description.—Virginia is similar to Rural New Yorker No. 57, except that the quality of the grain is better.

History.—Virginia is the result of a cross between an unnamed wheat (C. I. No. 1344) and Jones Fife, made by H. A. Miller, in 1905, who was then a representative of the United States Department of Agriculture at the Maryland Agricultural Experiment Station, College Park, Md., where the cross was made (*185*, p. 20).

Distribution.—The variety is grown in experiments in Virginia, West Virginia, Tennessee, and Arkansas, and small quantities have been distributed for commercial growing.

PRELUDE.

Description.—Plant spring habit, early, short; stem usually white, sometimes faintly purple on lower internodes, strong; spike awned, fusiform, middense, erect; glumes pubescent, yellowish, midlong, midwide, easily deciduous; shoulders narrow, oblique to square; beaks 2 to 5 mm. long; awns black, 2 to 5 cm. long; kernels dark red, short, hard, ovate, truncate; germ midsized; crease midwide, shallow to middeep, triangular; cheeks angular; brush small, short.

Prelude is distinct by its early maturity and its black awns. It shatters badly and therefore always should be harvested before it is entirely ripe. It usually is a low-yielding variety, but is well adapted to northern latitudes, where its earliness enables it to escape fall frosts. It also has shown to advantage in experiments on the southern border of the spring-wheat sections of the Great Plains area, where early maturity is an important factor. It is an excellent milling and bread-making variety (Pl. XLVIII, *A*).

History.—Prelude was originated by Dr. C. E. Saunders, cerealist of the Dominion Department of Agriculture, at the Central Experimental Farm, Ottawa, Canada (*167*, p. 118). The parentage of Prelude is shown by Buller (*50*, p. 186), as follows:

Ladoga (f) × White Fife (m)..............A. P. Saunders, 1888
Alpha (f) × Hard Red Calcutta (m)....A. P. Saunders, 1892
Fraser (m) × (downy) Gehun (f)..C. E. Saunders, 1903
Prelude.

Prelude was first distributed in 1913. It was introduced into the United States by the United States Department of Agriculture in 1915 for experimental purposes.

Distribution.—Prelude is grown at experiment stations in the northern spring-wheat sections of the United States. It is grown commercially in Minnesota and Wisconsin under the name of Wisconsin Wonder.

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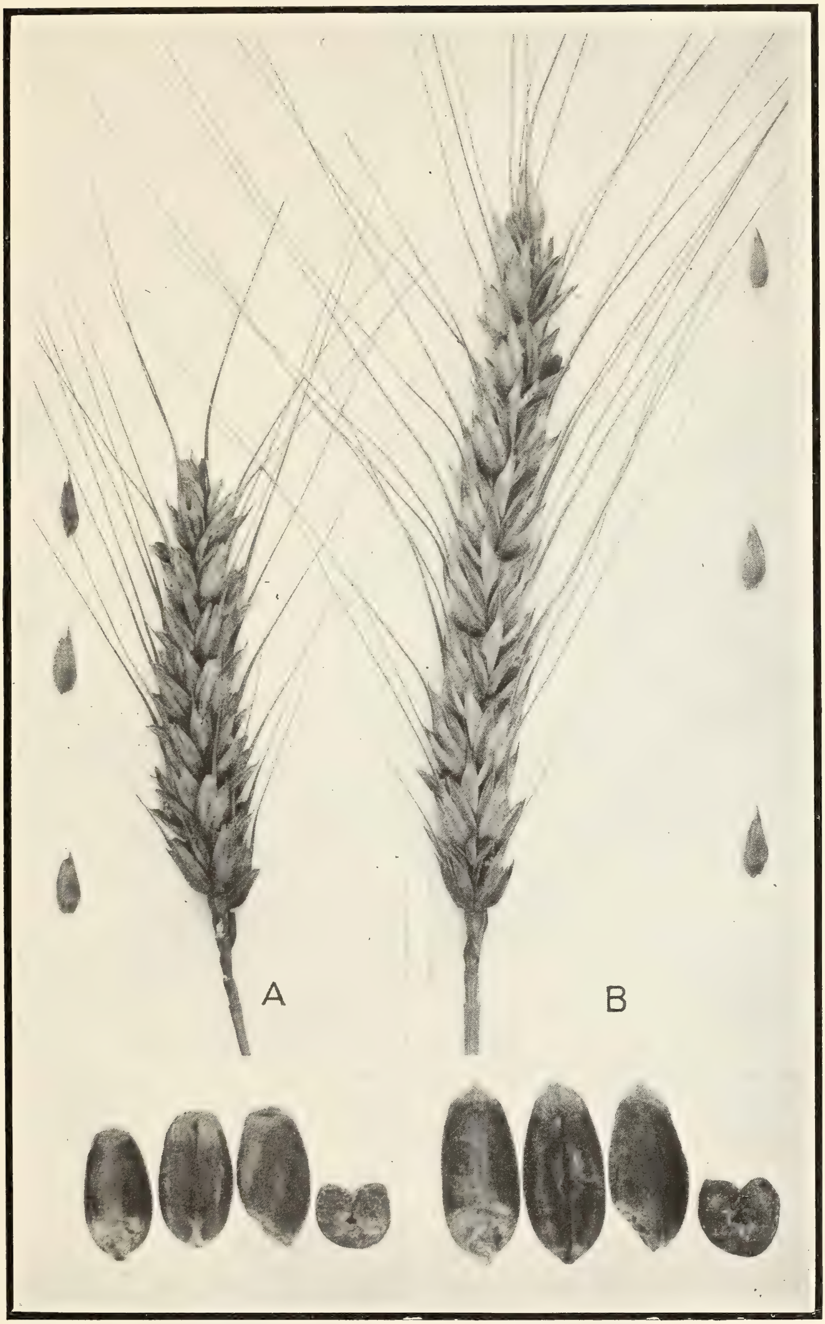
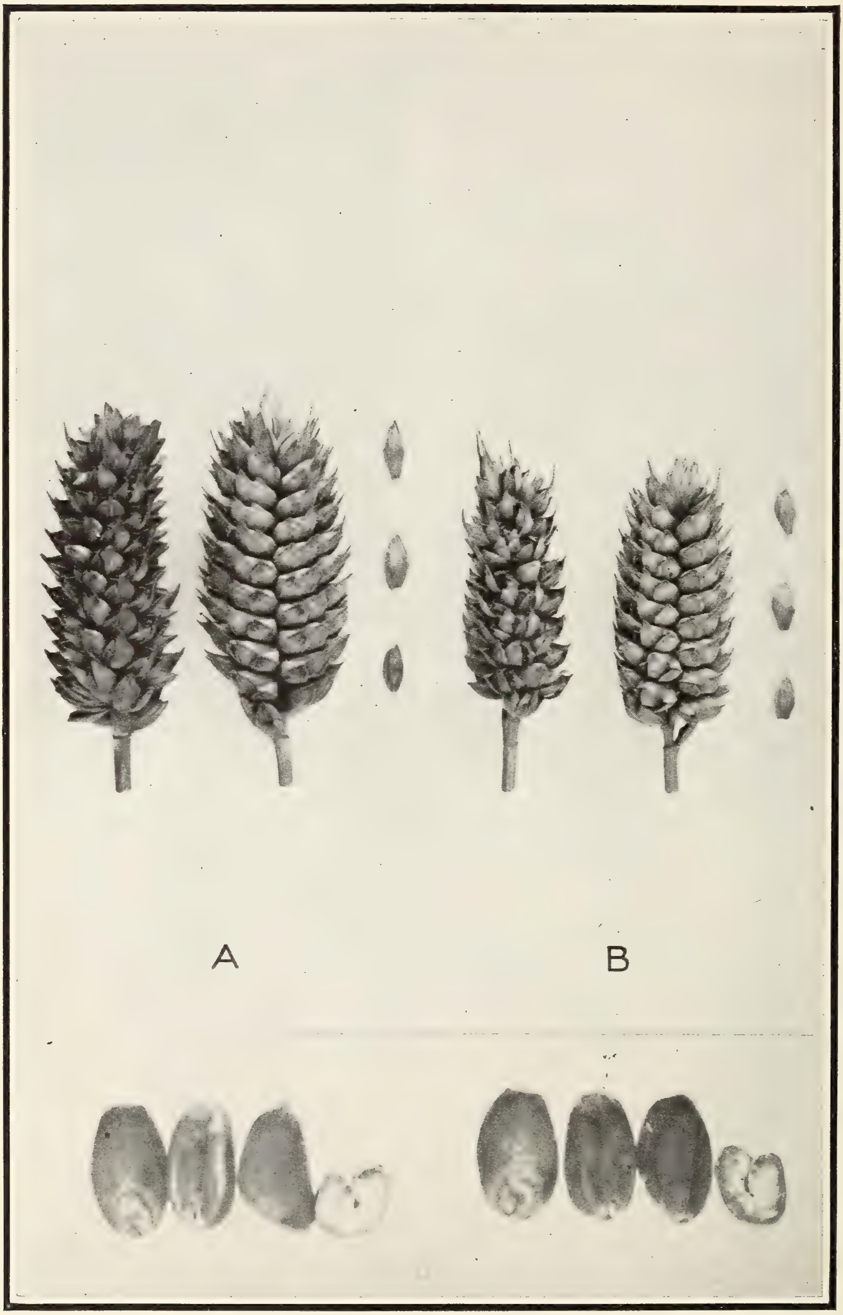
[28] Printed stationery of Mr. A. N. Jones.



PRELUDE (A). HUMPBACK (B).

Spike, face view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



HYBRID 128 (A). HYBRID 143 (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

Synonym.—Wisconsin Wonder. Prelude wheat has been distributed as Wisconsin Wonder by H. E. Krueger, of Beaver Dam, Wis. In advertising the variety Mr. Krueger claims to have originated it from the selection of a plant grown in a field of Marquis about 1910. The distribution of Wisconsin Wonder wheat dates from 1916. It was reported in 1919 from seven counties in Wisconsin.

HUMPBACK.

Description.—Plant spring habit, late, tall; stem white, midstrong; spike awned, fusiform, middense to lax, inclined; glumes pubescent, white, long, midwide; shoulders usually wanting, sometimes narrow, oblique; beaks 2 to 8 mm. long; awns 3 to 8 cm. long; kernels pale red, midlong to long, semihard, ovate, humped; germ large; crease midwide, deep, pitted; cheeks rounded to angular; brush small, long.

This variety is distinct because of its pubescent glumes and its rather large, soft kernels, which are distinctly humped. It is a very poor milling and bread-making variety. A spike, glumes, and kernels of Humpback are shown in Plate XLVIII, *B*.

History.—The Humpback variety originated from field selections made by J. P. Berglund, a farmer living near Kensington, Minn. (*190*, p. 1). The original head was probably the result of a natural field hybrid. Two strains were developed, the first being the strain above described, which was distributed about 1905. The second has glabrous glumes, but is otherwise similar. It is described elsewhere as Dixon.

Distribution.—Humpback wheat was reported sparingly grown in Illinois, Minnesota, Nebraska, North Dakota, South Dakota, and Wisconsin. (Fig. 67.)

Synonyms.—Bearded Bluestem and World Beater. Bearded Bluestem is the name by which the variety was first distributed by Mr. Berglund, but the name Humpback soon became attached to the variety and the use of the name Bearded Bluestem largely has been discontinued. World Beater is the name under which a wheat practically identical with Humpback was obtained from a farmer named Bruegger, in the vicinity of Williston, N. Dak., in 1913. At that time World Beater was cultivated to a small extent in that locality. It was not reported in 1919.

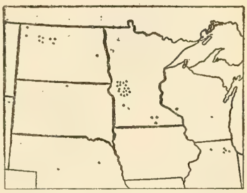


FIG. 67.—Outline map of the north-central United States, showing the distribution of Humpback wheat in 1919. Estimated area, 31,900 acres.

PENQUITE (PENQUITE'S VELVET CHAFF).

Description.—Plant winter habit, midseason, midtall; stem purple, midstrong; spike awned, fusiform, middense, nodding; glumes pubescent, brown, long, midwide, easily deciduous; shoulders wanting to narrow, usually oblique; beaks 1 to 2 mm. long; awns 3 to 7 cm. long; kernels red, midlong, soft, ovate, humped; germ midsized; crease midwide, middeep; cheeks rounded; brush small, midlong.

History.—According to Thorne (*192*, p. 618):

> This wheat originated in Clinton County, Ohio, where in 1857 or 1858 Mr. Abram Penquite, while cradling in a field of wheat, noticed three heads of a different variety from the rest of the field. These he saved and propagated, and from them has come the wheat now widely known in southwestern Ohio as the Velvet Chaff.

Distribution.—Several varieties are grown under the name of Velvet Chaff. Winter wheat of this description was sparingly reported as Velvet Chaff from Alabama, Arkansas, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Missouri, Ohio, Oklahoma, Pennsylvania, and Tennessee.

Synonyms.—Japanese Velvet Chaff and Velvet Chaff. Japanese Velvet Chaff is the name under which a wheat identical with Penquite was obtained by the United States Department of Agriculture at the Paris Exposition, held in France, in 1900. It has been grown in experiments in Virginia and Maryland, but is not known to be commercially grown.

Velvet Chaff is the name under which Penquite (Penquite's Velvet Chaff) has been best known in Ohio since about 1880. Although the name Velvet Chaff has become generally used for the variety, it is also confused with, and used for, other varieties, and for these reasons the name Penquite is here adopted.

CLUB WHEAT.

The plants of club wheat may be either winter or spring habit, and either tall or short. The straw is stiff and strong. The spikes usually are awnless but may be awned, are oblong or sometimes clavate or "club shaped," short, usually less than 2½ inches in length, very compact, and laterally compressed. The spikelets usually contain five fertile florets and spread at nearly a right angle to the rachis. The glumes and lemmas are persistent, so the grain does not shatter when ripe. The kernels of club wheat are small, laterally compressed or "pinched," because of crowding in the compact spikes. Most club-wheat kernels have a small, short brush and a narrow, very shallow crease. The grain usually is of rather poor quality for bread making.

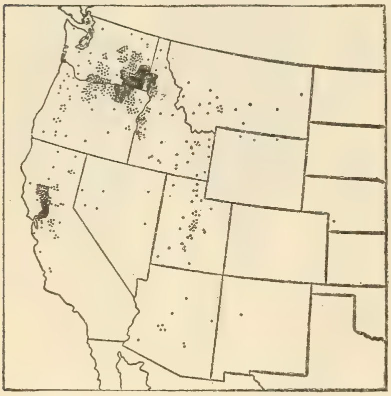


FIG. 68.—Outline map of the western United States, showing the distribution of club wheats in 1919. Estimated area, 1,020,300 acres.

The club wheats are distinguished from common wheats by the smaller, shorter, denser, laterally compressed spikes. The varieties of wheat grown in the eastern United States often referred to as club because of having clavate spikes do not belong to this species, but are common wheats.

The nonshattering and stiff-strawed characters of club wheats are of much economic importance in the Pacific Coast area, where they are principally grown, because in that area wheat commonly is cut and thrashed in one operation with a combined harvester long after the grain is fully ripe. Figure 68 shows the distribution of club wheats in the United States in 1919.

KEY TO THE VARIETIES OF CLUB WHEAT.

1a. Spike Awnless.
2a. Glumes Glabrous.
3a. Glumes White.
4a. Kernels White (*Triticum compactum humboldtii* Kcke.).
Kernels Short to Midlong.
Kernels Soft to Semihard. Page.
Winter Habit .... Hybrid 128 173
Spring Habit.
Plant tall.
Spike oblong-fusiform .... Little Club 174
Spike clavate .... Big Club 175
Plant short; glumes and kernels very short.
Spike elliptical .... Hybrid 143 176
Kernels Semihard to Hard.
Winter Habit.
Spike oblong-fusiform .... Hybrid 60 176
Spring Habit.
Spike elliptical .... Hybrid 63 176
4b. Kernels Red (*T. c. wernerianum* Kcke.)
Kernels Short to Midlong.
Kernels Soft to Semihard.
Spring Habit.
Kernels soft .... Hybrid 108 177
Kernels semihard .... Hybrid 123 177
3b. Glumes Brown.
4a. Kernels White (*T. c. rufulum* Kcke.).
Kernels Short to Midlong.
Kernels Soft to Semihard.
Spring Habit.
Spike oblong-fusiform; glumes dark brown.
Plant tall, late .... Jenkin 178
Spike clavate.
Glumes light brown .... Redchaff 178
Glumes bluish brown .... Bluechaff 178
4b. Kernels Red (*T. c. cretisum* Al.).
Kernels Short to Midlong.
Kernels Soft to Semihard.
Spring Habit.
Spike elliptical, stem purple .... Dale 179
2b. Glumes Pubescent.
3a. Glumes White.
4a. Kernels Red (*T. c. wittmackianum* Kcke.).
Kernels Short to Midlong.
Kernels Soft to Semihard.
Winter Habit; spike elliptical .... Coppei 179
3b. Glumes Brown.
4b. Kernels White.
Kernels Short to Midlong.
Kernels Soft to Semihard.
Spring Habit.
Plant short, early .... Wilbur 180
1b. Spike Awned.
2a. Glumes Glabrous.
3a. Glumes Brown.
4a. Kernels Red (*T. c. erinaceum* Kcke.).
Kernels Short to Midlong.
Kernels Soft to Semihard.
Spring Habit .... Mayview 180

DESCRIPTION, HISTORY, DISTRIBUTION, AND SYNONYMY OF CLUB WHEAT VARIETIES.

HYBRID 128.

Description.—Plant winter habit, midseason, midtall; stem white, strong, stout; spike awnless, elliptical, dense, erect; glumes glabrous, white, short, wide; shoulders narrow, usually rounding; beaks wide, obtuse, 0.5 mm. long; apical awns few, 2 to 10 mm. long; kernels white, short, soft, ovate to oval, irregular, humped; germ midsized, abrupt; crease midwide, shallow; cheeks angular; brush small, midlong.

This variety differs from Hybrid 60 in having shorter glumes. It is a true winter wheat, high yielding, but very susceptible to bunt or stinking smut.

Spikes, glumes, and kernels of Hybrid 128 wheat are shown in Plate XLIX, *A*, and a single spike in Plate V, Figure 7.

History.—Hybrid 128 was originated at Washington Agricultural Experiment Station, Pullman, Wash. Its history has been recorded by Schafer and Gaines (*170*, p. 8) as follows:

> Hybrid No. 128 is a cross between Jones Winter Fife and Little Club. It was originated in 1899 by Prof. W. J. Spillman. After being selected and tested for eight years it was distributed to ranchers for further testing.

Prof. Spillman started his work in wheat breeding at the Washington Agricultural Experiment Station in 1899. Valuable results were obtained, Hybrid 128 being only one of the varieties which resulted from the first crosses. The work was hardly commenced, however, before he left the institution, and the important task of making the selections, testing the many strains, and distributing the new varieties was left to other workers. His work with wheat, however, resulted in some of the very earliest discoveries of the fundamental principles of heredity in plant breeding. He left Pullman in June, 1902, and it was not until 1909 that he published the results of his studies in hybridization (*182*). In the same year he published a more popular bulletin from the Washington Agricultural Experiment Station, which gave some of the results of his early experiments (*183*).

The wheat breeding was continued at Pullman by Messrs. E. E. Elliott and Claude W. Lawrence (*86*), who were largely responsible for the distribution of some of the earlier hybrid varieties, including Hybrid 128. The work is still being continued and is now (1921) in charge of Prof. E. G. Schafer, agronomist, and Prof. E. F. Gaines, cerealist.

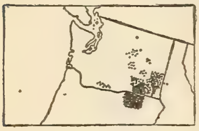


FIG. 69.—Outline map of a portion of the Pacific Northwest, showing the distribution of Hybrid 128 wheat in 1919. Estimated area, 259,900 acres.

Distribution.—Grown in Latah County, Idaho, 11 counties in eastern Washington and in Umatilla County, Oreg. It is the most widely grown club wheat in Washington. (Fig. 69.)

Synonyms.—Washington Hybrid No. 128, White Hybrid. The name White Hybrid is quite widely used for Hybrid 128 as well as the other white-kerneled hybrid wheats distributed by the Washington station.

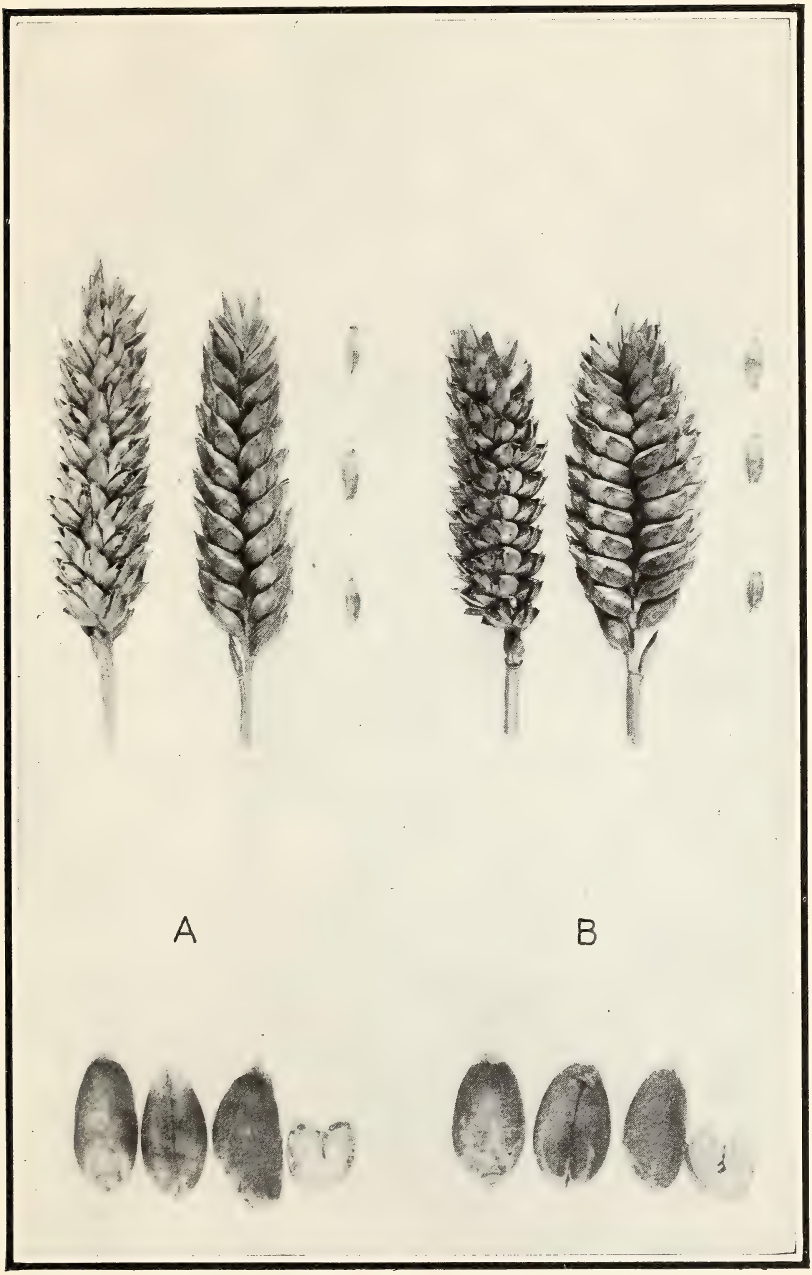
LITTLE CLUB.

Description.—Plant spring habit, midseason, midtall to tall; stem white, strong, stout; spike awnless, oblong-fusiform, dense, erect; glumes glabrous, white, midlong, midwide; shoulders midwide, usually rounded; beaks wide, obtuse, 0.5 mm. long; apical awns few, 2 to 10 mm. long; kernels white, short, soft, ovate, humped, acute; germ small; crease narrow, shallow; cheeks angular to rounded; brush small, midlong.

Little Club is distinguished from other white-glumed club varieties in having longer and more slender spikes and slender, pointed kernels.

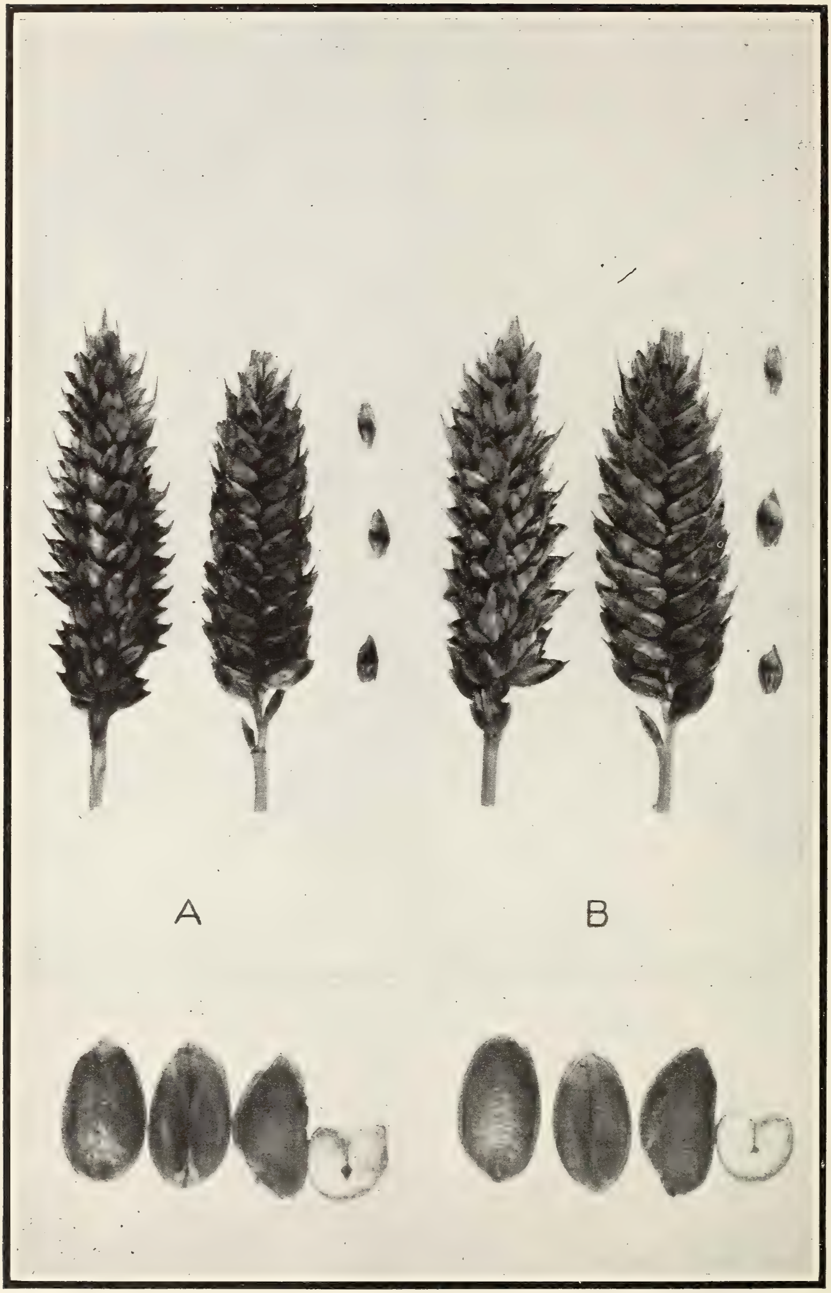
Spikes, glumes, and kernels of Little Club wheat are shown in Plate L, *A*.

History.—The origin of Little Club wheat is undetermined, but it is believed to have been introduced from Chile, as considerable quantities of club wheats were shipped to the Pacific Coast from Chile during the sixties and seventies.



LITTLE CLUB (A). BIG CLUB (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



JENKIN (A). REDCHAFF (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

It was reported grown in Yolo County, Calif., in 1878 (*53*, p. 339). According to Byron Hunter (*124*, p. 24), Little Club was probably one of the first varieties of wheat grown in the Columbia Basin of Oregon. For years it was the leading wheat in the Palouse district and continues to be a leading wheat grown along the foothills of the Blue Mountains in Oregon. In this section it often is fall sown, as it usually will stand the winters, though not as well as true winter varieties. It is now less extensively grown than formerly because of the introduction of more suitable varieties.

Distribution.—Little Club is grown in Arizona, California, Idaho, Montana, Nevada, Oregon, Utah, and Washington. (Fig. 70.)

Synonym.—Small Club.

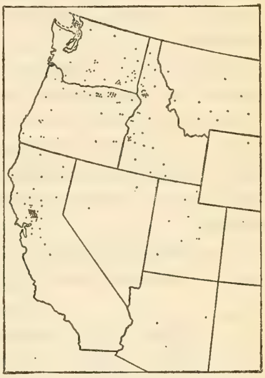


FIG. 70.—Outline map of the western United States, showing the distribution of Little Club wheat in 1919. Estimated area, 106,100 acres.

BIG CLUB.

Description.—Plant spring habit, midseason, midtall to tall; stem white, curved, strong, stout; spike awnless, elliptical to clavate, dense, erect; glumes glabrous, white, midlong, midwide; shoulders midwide, usually rounded; beaks wide, obtuse, 0.5 mm. long; apical awns few, 2 to 5 mm. long; kernels white, short, soft, nearly oval; humped; germ small; crease narrow, shallow; cheeks usually angular; brush small, midlong.

Big Club differs from Little Club in having wider, shorter, and thicker spikes, in having curved peduncles, and wider and rounder kernels. The shape of the spike is very similar to that of Hybrid 128. Spikes, glumes, and kernels of Big Club wheat are shown in Plate L, *B*.

History.—Big Club wheat is reported to have been introduced into Oregon about 1870 from Chile (*10*). The variety was first known as Chile Club and Oregon Club. It was evidently first grown in California, for in 1866 Chile Club was reported to be "remarkably well adapted to the soil and climate" of that State (*84*, p. 586).

The name Big Club has been used for the variety only during the last 10 to 15 years, and it probably came into use to distinguish it from Little Club.

Distribution.—Big Club is grown in California, Idaho, Montana, Oregon, Utah, and Washington. (Fig. 71.)

Synonyms.—Big Four, Chile Club, Crookneck Club, Montezuma Club, Oregon Club, Salt Lake Club. Big Four is a name under which Big Club wheat is known in the State of Idaho. Chile Club is the name under which this wheat was first grown in the United States. It has become best known under this name in California. Crookneck Club is the name which became applied to Big Club wheat because of the distinct crooks or curves which usually occur in the upper portion of the peduncle. Montezuma Club is a name for Big Club wheat in California. Oregon Club is a name which was early used for Big Club in the State of Oregon. It was widely known by that name in the seventies. Salt Lake Club is a name which became used for Big Club wheat in the State of Utah. How and when the name originated is not known.

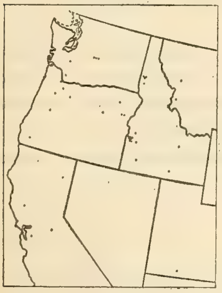


FIG. 71.—Outline map of the Pacific and Basin areas, showing the distribution of Big Club wheat in 1919. Estimated area, 21,700 acres.

HYBRID 143.

Description.—Plant intermediate to spring habit, midseason to late, midtall; stem white, strong; spike awnless, elliptical, dense, erect; glumes glabrous, white, short, wide; shoulders midwide, usually rounded; beaks wide, obtuse, 0.5 mm. long; apical awns few, 2 to 10 mm. long; kernels white, very short, soft, ovate to oval to oblong, humped; germ small to midsized, abrupt; crease narrow, shallow; cheeks angular; brush very small, short to midlong.

Hybrid 143 is distinct in having very short kernels. Spikes, glumes, and kernels of this variety are shown in Plate XLIX, *B*.

History.—This wheat was originated at the Washington Agricultural Experiment Station, Pullman, Wash., from a cross between White Track and Little Club, made by Prof. W. J. Spillman in 1899. It was first distributed in 1907 by the Washington station and has been grown both from fall or spring sowing.

Distribution.—Hybrid 143 was reported in 1919 from seven counties in eastern Washington. It was reported grown most extensively in Columbia County, where it made up 15 per cent of the total wheat of the county. (Fig. 72.)

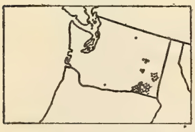


FIG. 72. — Outline map of a portion of the Pacific Northwest, showing the distribution of Hybrid 143 wheat in 1919. Estimated area, 49,500 acres.

Synonyms.—Shot Club, White Hybrid. The name Shot Club is sometimes used for Hybrid 143 by men in the grain trade because of its peculiar short, roundish, shotlike kernels.

HYBRID 60.

Description.—Plant winter habit, midseason, short to midtall; stem white, strong; spike awnless, elliptical, dense, erect; glumes glabrous, white, midlong, narrow; shoulders narrow, usually rounded; beaks wide, obtuse, 0.5 mm. long; apical awns few, 5 to 30 mm. long; kernels white, short, hard, ovate, humped; germ small; crease narrow, shallow; cheeks usually angular; brush small, short to midlong.

History.—This variety originated at the Washington Agricultural Experiment Station from a cross between Turkey and Little Club made by Prof. W. J. Spillman, at Pullman, Wash., in 1899. It was increased and was distributed in 1905 from the Washington station by E. E. Elliott.

Distribution.—Grown in experiments at field stations in the Pacific Northwest. It is not now known to be commercially grown.

HYBRID 63.

Description.—Plant spring habit, midseason, midtall; stem white, strong; spike awnless, elliptical to oblong, dense, erect; glumes glabrous, white, midlong, narrow to midwide; shoulders midwide, usually rounded; beaks wide, obtuse,, 0.5 mm. long; apical awns few, 2 to 5 mm. long; kernels white, short, semihard to hard, ovate to elliptical, humped; germ small; crease narrow, shallow; cheeks rounded to angular; brush small, midlong.

This variety is distinguished by its short spike and rather long, narrow glumes.

History.—This wheat was originated at the Washington Agricultural Experiment Station, Pullman, Wash. It is of hybrid origin, being one of the results of crosses made by Prof. W. J. Spillman in 1899 between Turkey and Little Club, in an effort to produce a club wheat with a true winter habit. This variety was distributed to farmers in 1907 by the Washington station. Although it is a true spring wheat, it has usually been grown from fall sowing and proved to be a good yielder under a rainfall of 15 to 18 inches.

Distribution.—Grown in Jackson, Umatilla, and Wasco Counties, Oreg., and Columbia, Franklin, Garfield, Kittitas, and Walla Walla Counties, Wash. It is most important in Walla Walla County, Wash.

Synonym.—White Hybrid.

HYBRID 108.

Description.—Plant intermediate to spring habit, midseason, midtall; stem white, strong; spike awnless, elliptical, dense, erect; glumes glabrous, white, midlong, midwide; shoulders midwide, usually rounded; beaks wide, obtuse, 0.5 mm. long; apical awns few, 2 to 5 mm. long; kernels red, usually short, soft, oval to elliptical, humped, pinched; germ small; crease narrow, shallow; cheeks angular; brush small, midlong.

History.—This variety was originated at the Washington Agricultural Experiment Station, Pullman, Wash., from a cross between Jones Fife and Little Club, made by Prof. W. J. Spillman in 1899. The variety was distributed by the Washington station in 1907, after the early trials had indicated that it was a good yielding variety. Later experiments, however, did not show favorable results, and because of its poor milling qualities its further distribution was discouraged.

Distribution.—Grown in Whitman County, Wash.

Synonyms.—Red Hybrid and Red Walla. Red Hybrid is a name used to distinguish this variety and Hybrid 123 from the white-kerneled hybrid club varieties previously mentioned. Red Walla is used as a synonym for Hybrid 108 and Hybrid 123 because it is the name of the subclass in which all red-kerneled club wheats are graded according to the Federal Grain Standards. The name Red Walla frequently is used for the Red Russian variety as well as the club wheats.

HYBRID 123.

Description.—Plant spring habit, midseason to late, midtall; stem white, strong; spike awnless, oblong to elliptical, dense, erect; glumes glabrous, white, short, midwide; shoulders narrow, usually rounded; beaks wide, obtuse, 0.5 mm. long; apical awns few, 2 to 5 mm. long; kernels red, small, soft to semihard, ovate, humped; germ small; crease midwide, shallow; cheeks angular; brush small, midlong.

Hybrid 123 is the only important red-kerneled variety of club wheat in the United States. It is distinguished from Hybrid 108 by having slightly harder kernels.

History.—The history of Hybrid 123 is the same as that stated for Hybrid 108. This variety, however, became much more popular than No. 108.

Distribution.—Hybrid 123 was reported in 1919 from Sherman County, Oreg., and six counties in Washington, being grown most extensively in Klickitat County.

Synonyms.—Red Hybrid and Red Walla. These names are discussed under Hybrid 108.

JENKIN (JENKIN'S CLUB).

Description.—Plant spring habit, late, tall; stem white, strong; spike awnless, oblong-fusiform, dense, erect; glumes glabrous, brown, midlong, midwide; shoulders midwide, usually rounded; beaks broad, obtuse, 0.5 mm. long, apical awns few, 2 to 10 mm. long; kernels white, small, soft, broadly ovate, humped; germ small, abrupt; crease midwide, middeep to deep, sometimes pitted; cheeks angular to rounded; brush small, midlong.

This is the tallest commercial variety of club wheat and is taller than most common wheats grown. Spikes, glumes, and kernels of Jenkin are shown in Plate LI, *A*.

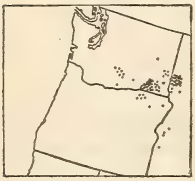


FIG. 73.—Outline map of a portion of the Pacific Northwest, showing the distribution of Jenkin wheat in 1919. Estimated area, 66,500 acres.

History.—The origin of Jenkin wheat is undetermined. It is known to have been grown in the vicinity of Wilbur, Lincoln County, Wash., about 1895 (*125*). By 1900 it became grown around Walla Walla, Wash., and Pendleton, Oreg., and during the next decade largely replaced other varieties in those sections, being grown from both fall and spring sowing.

Distribution.—Grown in Idaho, Oregon, and Washington. (Fig. 73.)

REDCHAFF (RED CHAFF CLUB).

Description.—Plant spring habit, midseason, midtall; stem white, strong; spike awnless, clavate, dense, erect; glumes glabrous, light brown, midlong, midwide; shoulders midwide, usually oblique; beaks wide, obtuse, 0.5 mm. long; apical awns few, 2 to 10 mm. long; kernels white, short, soft, ovate, humped; germ small, abrupt; crease midwide, shallow; cheeks usually angular; brush small, midlong.

Redchaff differs from Jenkin in being shorter, earlier, in having a more clavate spike and lighter brown glumes. Spikes, glumes, and kernels of Redchaff are shown in Plate LI, *B*.

History.—The origin of Redchaff is undetermined. According to Hunter (*124*, p. 24), it was an important variety of club wheat grown in the Columbia Basin of Oregon and Washington in 1907.

Distribution.—Grown in Idaho, Oregon, and Washington. (Fig. 74.)

Synonyms.—Oregon Red Chaff and Red Chaff Club. The name Oregon Red Chaff sometimes is used for the Redchaff variety, but is more commonly applied to Foisy. Red Chaff Club is the name used by most growers of the variety.

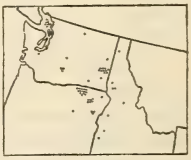


FIG. 74.—Outline map of a portion of the Pacific Northwest, showing the distribution of Redchaff wheat in 1919. Estimated area, 40,000 acres.

BLUECHAFF (BLUE CHAFF CALVERT CLUB).

Description.—Plant intermediate to spring habit, late, midtall; stem white, strong; spike awnless, clavate, dense, erect; glumes glabrous, bluish brown, midlong, midwide; shoulders wanting to narrow, usually rounded; beaks narrow, incurved, obtuse, 0.5 to 1 mm. long; apical awns few, 2 to 20 mm. long; kernels white, short to midlong, soft, ovate, humped; germ small; crease midwide, shallow; cheeks angular; brush small, midlong.

The glumes of Bluechaff have a distinct bluish tinge not observed in any other club wheats. Spikes, glumes, and kernels of this variety are shown in Plate LII, *A*.

History.—The origin of Bluechaff (Blue Chaff Calvert Club) was recorded,[29] by James Calvert, of Junction City, Oreg., as follows:

> My boy, A. C. Calvert, while shocking after me while I was binding, 24 years ago this harvest, found seven heads of the wheat from one stalk. It looked so much better, harder, and plumper wheat than any of the other wheat, that I took it home and planted it in the garden and hoed it the same as we did the corn, and it developed such plump heads and kernels of wheat that I kept on until the seventh year, when we raised 750 bushels of wheat.

Distribution.—Reported in 1919 from Jackson County, Oreg. It is known to be or to have been grown in Benton, Linn, and Lane Counties, Oreg.

DALE (DALE GLORIA).

Description.—Plant spring habit, midseason, short to midtall; stem purple, strong, stout; spike awnless, elliptical, dense, erect; glumes glabrous, dark brown, midlong, midwide; shoulders wanting to narrow, oblique; beaks wide, obtuse, 0.5 mm. long; apical awns several, 3 to 20 mm. long; kernels red, short to midlong, soft, ovate, humped, pinched; germ small; crease narrow, shallow; cheeks rounded to angular; brush small, midlong.

This variety is distinguished by its red kernels and purple straw. Dale (Dale Gloria), as commercially grown, usually is a mixture, the type described above predominating. White-kerneled strains, having both white and brown glumes, have been obtained from commercial fields. Spikes, glumes, and kernels of this variety are shown in Plate LII, *B*.

History.—The origin of Dale (Dale Gloria) wheat has been recorded by Hunter (*125*), as follows:

> During the year 1900 Mr. William H. Dale, of Helix, Umatilla County, Oreg., found a stool of wheat of eight heads growing among his other wheat. He recognized the superior qualities of this individual plant, saved the seed, and planted it by itself. The next year, 1901, he raised 4 pounds of seed. In 1902 he raised 5 bushels, in 1903 there were 51 sacks, and in 1904, 4,000 bushels. Knowing no name for the variety he called it Dale Gloria.

Distribution.—Grown in Umatilla County, Oreg., and Whitman County, Wash.

COPPEI.

Description.—Plant winter habit, midseason, midtall; stem white, strong; spike awnless, oblong to elliptical, dense, erect; glumes pubescent, white, midlong, midwide; shoulders narrow, usually oblique; beaks wide, obtuse, 0.5 to 1 mm. long; apical awns several, 2 to 15 mm. long; kernels red, short to midlong, soft to semihard, ovate, humped; germ midsized; crease midwide, middeep; cheeks rounded to angular; brush small, midlong. (Pl. LIII, *A*.)

History.—Coppei was developed by J. L. Harper, who, in the fall of 1907, selected a plant of an unknown variety found in a field of Little Club belonging to W. G. Preston, located near Coppei Creek, 3 miles south of Waitsburg, Wash. Mr. Harper saved five heads from this plant and sowed the seed from them in his garden in Waitsburg. In 1908 he thrashed from this plat about a pound of wheat. This he gave to J. B. Kinder, a farmer, who increased the seed until 1911, when he distributed it to others. Mr. Harper named the variety Coppei because it came from a farm near Coppei Creek.[30] The variety is probably the result of a natural field cross between Little Club and Jones Fife.

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[29] Correspondence with Ira P. Whitney, county agricultural agent, Eugene, Oreg., dated Oct. 17, 1921.

[30] Correspondence from Prof. R. K. Bonnett, Idaho Agricultural Experiment Station, dated July 24, 1920.

Distribution.—Coppei was reported in 1919 from Columbia and Whitman Counties, Wash.

WILBUR (EARLY WILBUR).

Description.—Plant spring habit, early, short; stem white, strong; spike awnless, oblong, dense, erect; glumes pubescent, brown, short, midwide; apical awns many, 1 to 3 cm. long; kernels white, midsized, soft.

History—The origin of Early Wilbur was recorded by Hunter (*125*) in 1909 to be as follows:

> Some 10 or 12 years ago Mr. W. J. Mariner, of Blalock, Oreg., was at Wilbur, Wash., where he found the farmers growing Jenkin's Club. He was pleased with the wheat and shipped a carload home for seed. In growing the Jenkins he noticed stools of another variety growing here and there that were earlier and filled better than the Jenkins. Seed of this early variety was gathered and grown separately until 2,500 bushels were on hand, when it was sold at $1 per bushel for seed. Each year the plat was carefully looked over and individual plants not true to type were discarded. Because of its earliness and because the wheat was found in seed that came from Wilbur, Wash., Mr. Mariner called it Early Wilbur. Considerable of this wheat is now grown in Sherman and Gilliam Counties, in Oregon, as well as other localities.

Distribution.—Reported in 1919 from Gilliam, Jefferson, and Sherman Counties, Oreg.

MAYVIEW.

Description.—Plant spring habit, late, midtall; stem usually white, sometimes faintly purple on lower internodes; spike awned, elliptical to clavate, dense, erect; glumes glabrous, brown, midlong, wide; shoulders midwide, usually rounded; beaks wide, incurved, 1 to 4 mm. long; awns 2 to 5 cm. long; kernels red, short, soft, ovate, humped, curved; germ small; crease midwide, shallow; cheeks usually angular; brush small, short.

This variety is distinguished by the awned spikes. (Pl. LIII, *B.*)

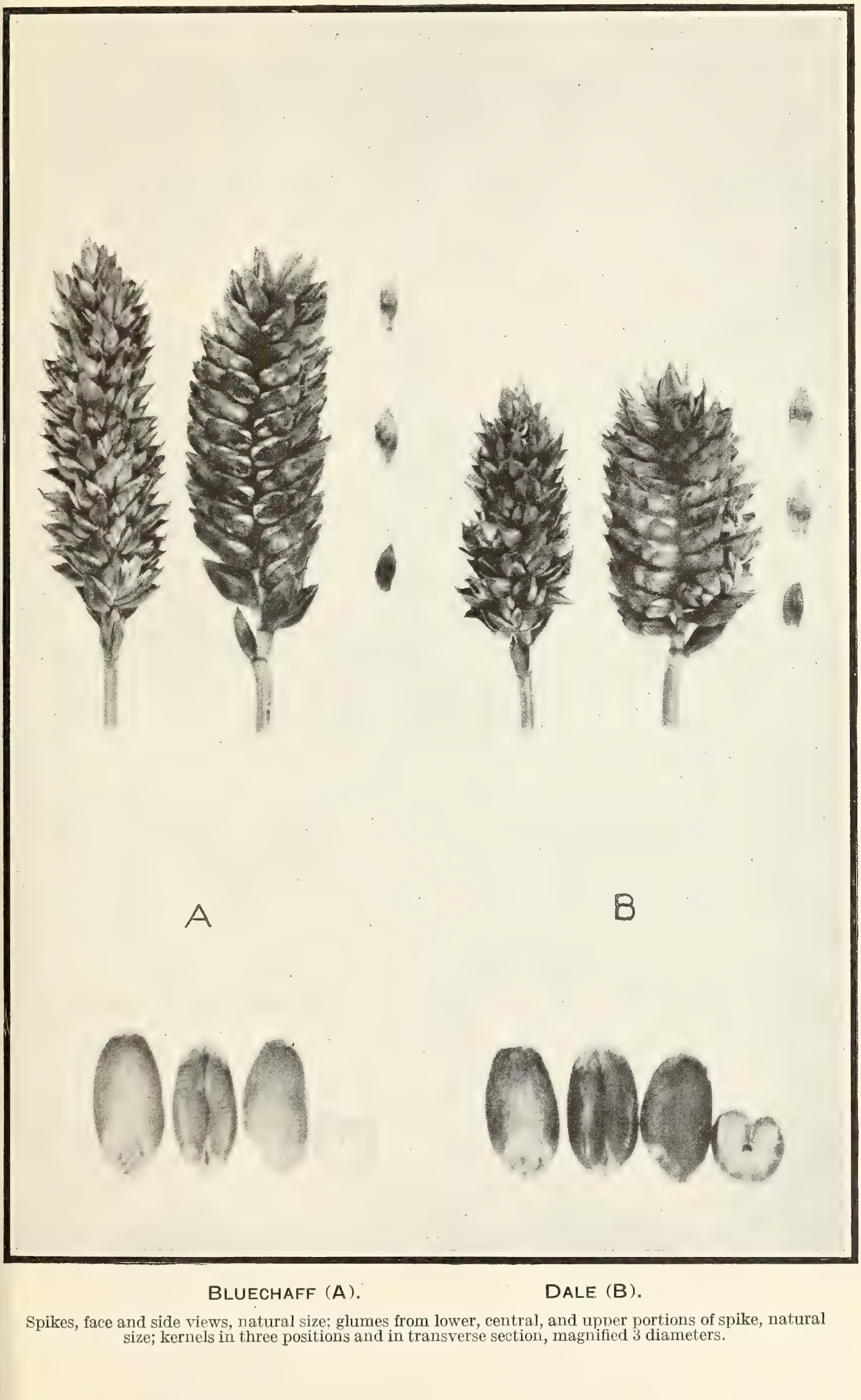
History.—This wheat was found growing in the summer of 1917 in the vicinity of May View, Wash., by Prof. E. F. Gaines, of the Washington Agricultural Experiment Station, who named the variety Mayview. It originated from a selection of an admixture in a field of Fortyfold in 1911 or 1912. Several thousand bushels were said to have been grown around May View, Wash., by 1915. Its culture has since been largely discontinued on account of its awns.

Distribution.—Mayview was not reported in the survey of 1919, but samples of the variety have been received for identification from Garfield County, Wash., Adams County, Oreg., and Fergus County, Mont.

POULARD WHEAT.

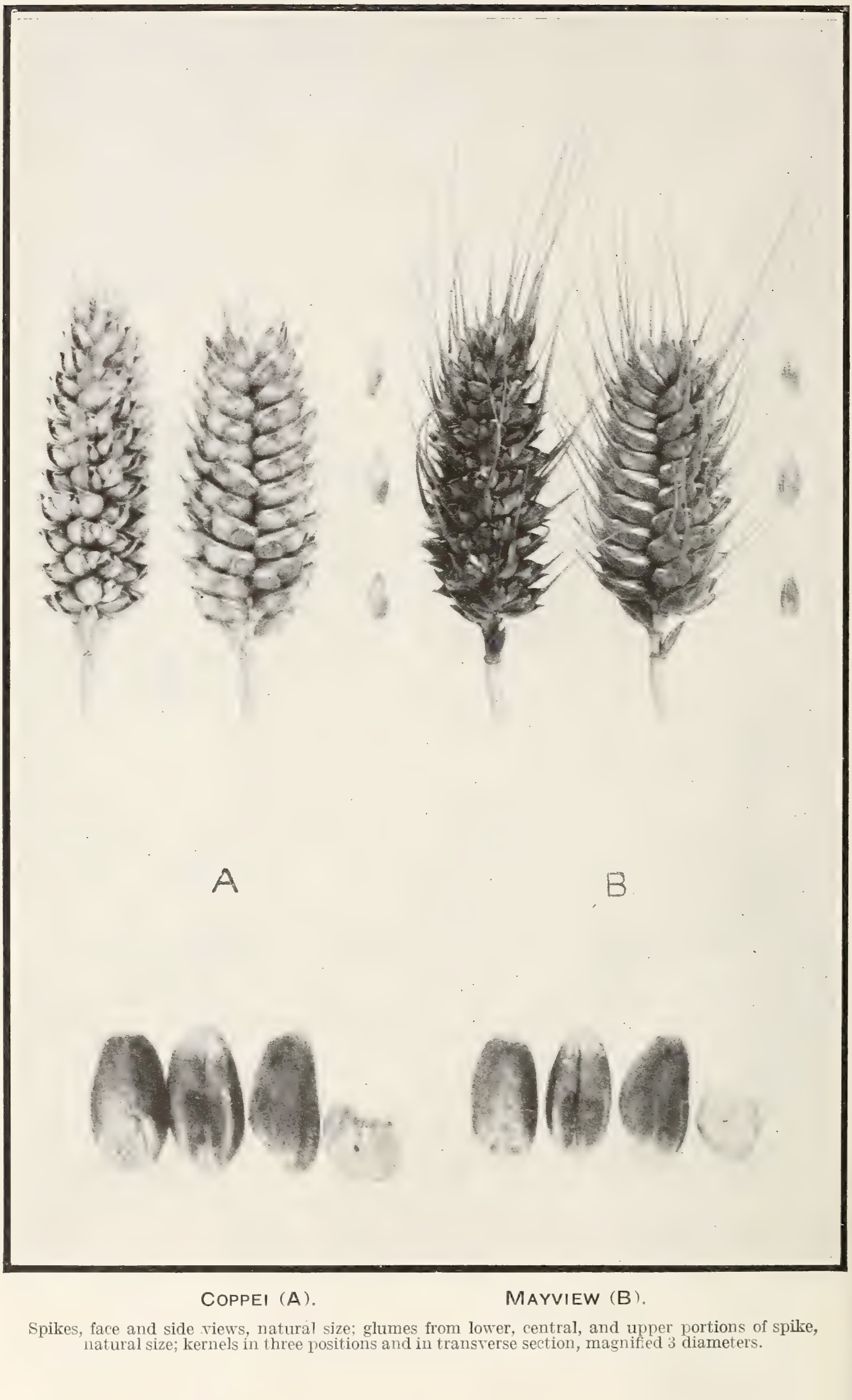
The poulard wheats usually are tall, with broad leaves. The culms are thick, usually solid, but sometimes pithy. The spikes are long and occasionally compound or branched. The spikelets are compactly arranged on the spike and the glumes are short and sharply keeled. The kernels are thick, humped, and mostly hard, but usually become very starchy (yellow berry).

The poulards are most closely related to the durums. The glumes and kernels usually are shorter and the kernels thicker in the dorso-



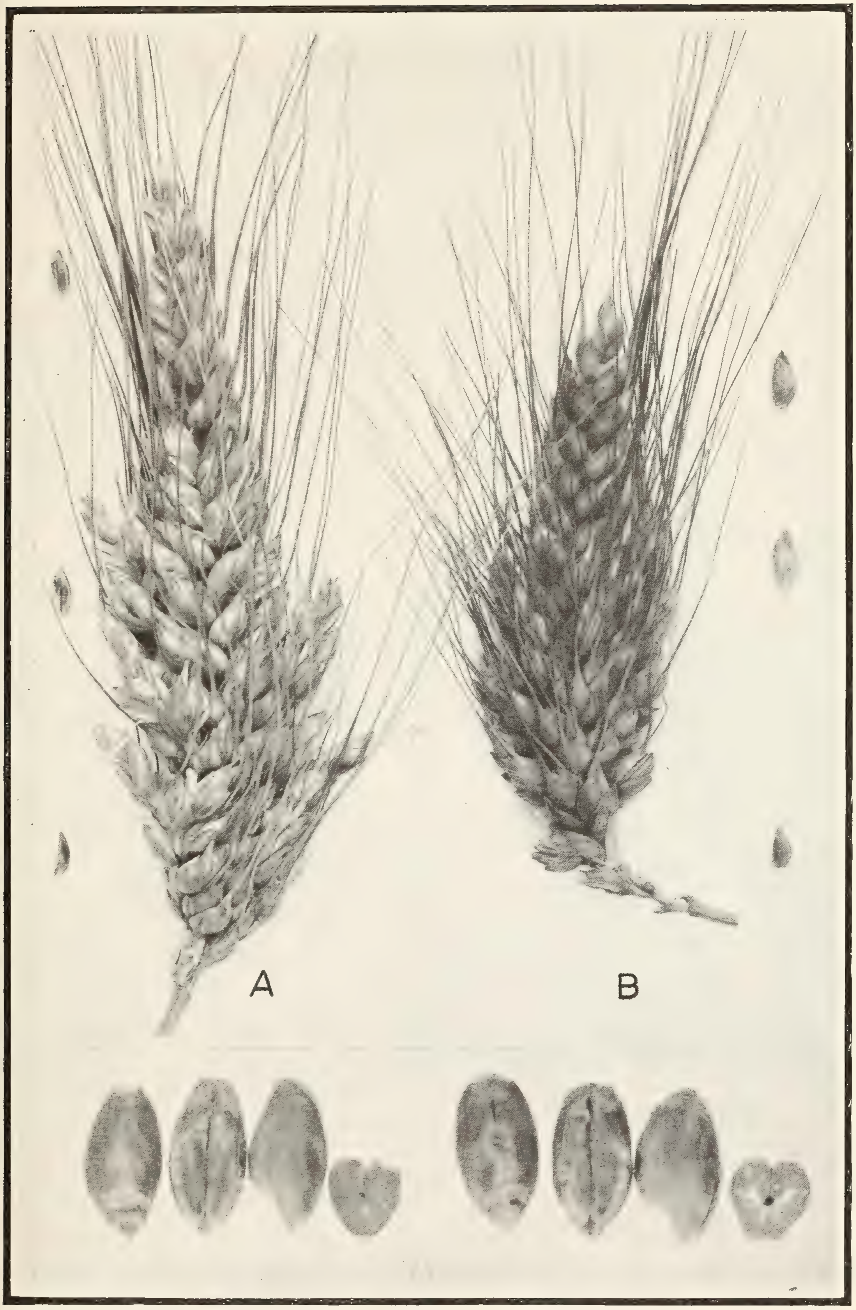
BLUECHAFF (A). DALE (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



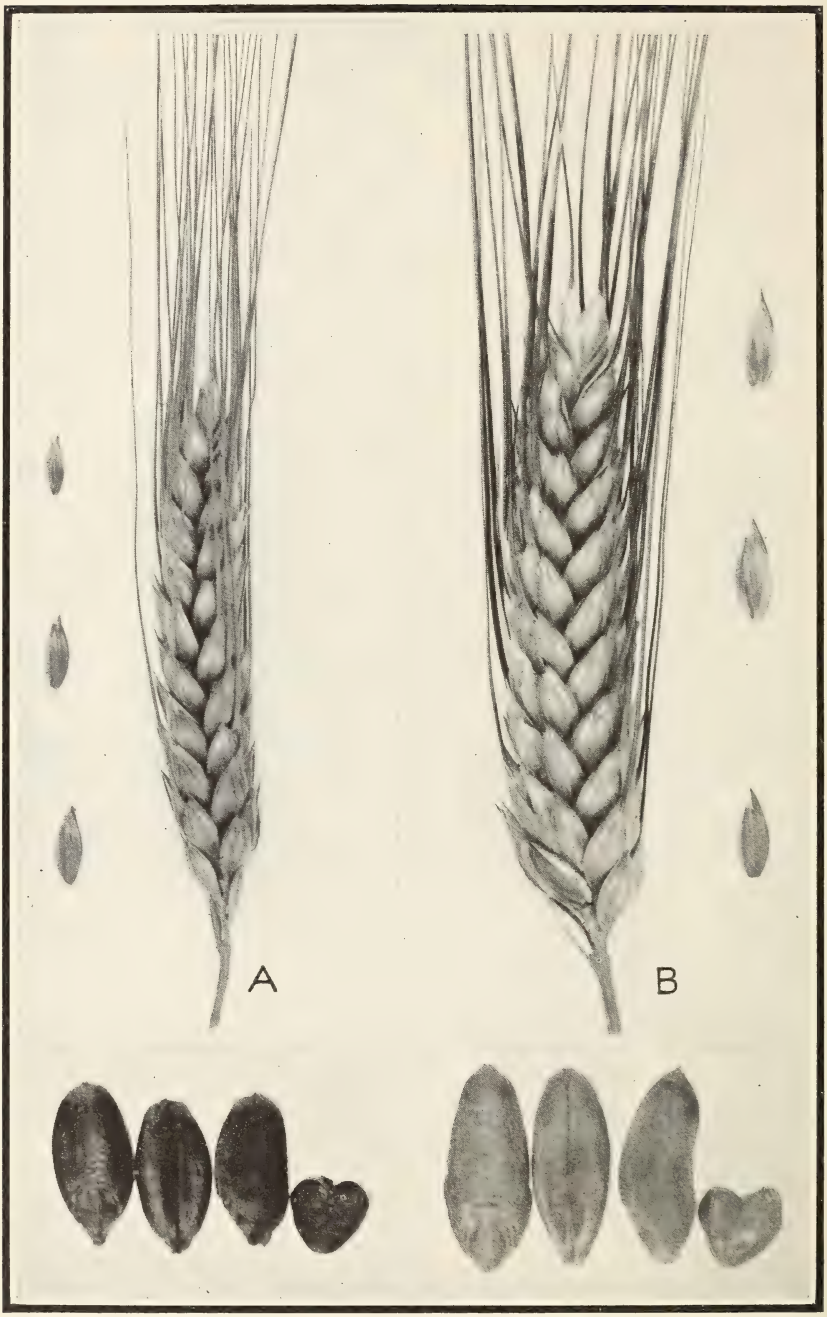
COPPEI (A). MAYVIEW (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



ALASKA (A). TITANIC (B).

Spike, side view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



PENTAD (A). PELISS (B).

Spike, side view, natual size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

ventral diameter and are somewhat softer. In many instances the varieties of poulard and durum are so near alike that it is difficult to distinguish them.

Only a few varieties of poulard wheat are cultivated in the United States, and the grain of these is of no commercial value except as feed for stock. The varieties grown can be distinguished by the accompanying key.

KEY TO THE VARIETIES OF POULARD WHEAT.

1a. Spike Simple.
2a. Spike Awned.
3a. Glumes Pubescent.
4a. Glumes White.
5a. Kernels Red (*Triticum turgidum jodurum* Al.).
Kernels Short to Midlong. Page.
Spring Habit..................................Clackamas................ 181
1b. Spike Branched.
2a. Spike Awned.
3a. Glumes Glabrous.
4a. Glumes White.
5a. Kernels White
Kernels Short to Midlong.
Spring Habit..................................Alaska.................... 182
3b. Glumes Pubescent.
4a. Glumes Brown.
5a. Kernels White (*T. t. mirabile* Kcke.).
Kernels Midlong to Long.
Winter Habit..................................Titanic.................... 182
5b. Kernels Red (*T. t. linnaeanum* Al.).
Kernels Short to Midlong.
Winter Habit..................................Winter Alaska.......... 183

DESCRIPTIONS, HISTORY, DISTRIBUTION, AND SYNONOMY OF POULARD WHEAT VARIETIES.

CLACKAMAS (CLACKAMAS WONDER).

Description.—Plant spring habit, late, tall; leaves pubescent; stem white, weak to midstrong; spike simple, awned, oblong, middense, nodding; glumes glabrous with pubescent edges, white with bluish black edges, midlong, midwide; shoulders narrow, oblique to elevated; beaks wide, 1 to 2 mm. long; awns black, 5 to 18 cm. long; kernels red, midlong to long, hard, usually becoming starchy, broadly ovate, truncate at tip; crease midwide, shallow; cheeks angular; brush midsized, short.

Clackamas differs from other varieties of poulard wheat grown in the United States in having simple spikes. It differs from the old Rivet wheat of England in having a spring habit and partly glabrous glumes. As grown commercially, Clackamas is somewhat mixed with common wheat and also contains several other types of simple-spiked poulard wheat.

History.—The origin of this variety is not known. Seed of the strain above described was obtained in 1918 from New Mexico, where it has been grown to a considerable extent for several years, apparently without a name. A wheat which apparently is identical with the above has been grown in Clackamas County, Oreg., for several years under the name Clackamas Wonder.

Distribution.—Grown in New Mexico and Oregon.

ALASKA.

Description.—Plant spring habit, late, tall; stem white, midstrong, spike branched, awned, nodding; glumes glabrous, brown, short, midwide; shoulders narrow, usually rounded; beaks nearly wanting; awns black, 3 to 12 cm. long; kernels white, short to midlong, hard, often becoming starchy, ovate, humped; germ midsized; crease midwide, shallow, sometimes pitted; cheeks usually angular; brush midsized, short.

Alaska is recognized by the composite spikes, glabrous glumes, and white kernels. A spike, glumes, and kernels of this variety are shown in Plate LIV, *A*.

History.—This variety of poulard wheat probably has been introduced into this country several times from the Mediterranean region of Europe, where poulard wheats are grown commercially to a small extent. The first introduction of this wheat into the United States was thought by Ball and Leighty (*44* p. 4) to have been in 1806, when it was brought from Ireland under the name of Jerusalem. Several other introductions have been recorded in American literature. The wheat often has been used by unscrupulous seedsmen for extravagant exploitation. The names listed as synonyms have all been used at one time or another for the variety in the United States. In recent years the name Alaska has been generally adopted for the wheat. It was the name used for the variety by Abraham Adams, of Juliaetta, Idaho, who distributed seed of the variety in the Pacific Northwest from about 1904 to 1908.

Distribution.—Alaska wheat was reported in 1919 from Arizona, New Mexico, Oregon and Pennsylvania. It also is known to be grown to a small extent in California, North Dakota, Montana, and Idaho.

Synonyms.—Egyptian, Eldorado, Jerusalem, Many Headed, Many Spiked, Multiple Headed, Miracle, Mortgage Lifter, Mummy, Reed, Seven Headed, Seven Headed Sinner, Smyrna, Syrian, Taos, Wheat of Miracle, Wheat 3,000 Years Old, Wild Goose.

The names Egyptian, Jerusalem, Mummy, Smyrna, Syrian, and Wheat 3,000 Years Old were applied to this wheat by exploiters who claimed the wheat had been discovered in ancient tombs in Africa or Asia.

The names Many Headed, Many Spiked, Multiple Headed, Seven Headed, and Seven Headed Sinner have been used because of the composite spikes which sometimes produce several branches.

Eldorado, Miracle, Mortgage Lifter, and Wheat of Miracle are names given to the wheat because of its supposed large yields.

Reed is a name used for Alaska because of its tall coarse stem, which is reedlike. Taos is a name long used for Alaska in New Mexico and Utah. Wild Goose is a name given Alaska and several other wheats by men who claimed to have obtained the seed from the crop of a wild goose which had been shot.

TITANIC.

Description.—Plant winter habit, late, midtall to tall; stem white, midstrong, stout; spike branched, awned, nodding; glumes pubescent, brown, short, narrow; shoulders wanting to narrow, oblique; beak 0.5 mm. long; awns black, usually deciduous, 3 to 10 cm. long; kernels white, midlong, semihard, usually becoming very starchy, oval to ovate, humped; germ midsized; crease midwide, shallow, sometimes pitted; cheeks angular; brush midsized, short.

This variety differs from Alaska in having a winter habit and pubescent brown glumes. A spike, glumes, and kernels are shown in Plate LIV, *B*.

History.—The Titanic wheat was introduced into the United States by Harry Towell, of Fort Stanley, Wash., in 1912. Mr. Towell had obtained 12 kernels from a friend in England, who had obtained a very small quantity from an importation made into that country from Argentina. The wheat was first grown on the San Juan Islands, in Washington, by Mr. Towell, and by 1916 he had about 100 acres. J. C. Hawkins, then a student at the Oregon Agricultural College, contracted to sell the wheat in 1916 for seed at $1 a pound. He gave it the name Titanic, because of the marine disaster which occurred during the year the variety was introduced, Mr. Towell, the introducer, being one of the surviving passengers on the vessel.

Distribution.—Grown to a very small extent in the Puget Sound section of Washington.

WINTER ALASKA.

Description.—Plant winter habit, late, midtall; stem white, midstrong, stout; spike branched, awned, nodding; glumes pubescent, brown, short, narrow; shoulders narrow, usually oblique; beaks 1 to 2 mm. long; awns black, usually deciduous; awns 3 to 10 cm. long; kernels red, small to midsized, hard, often becoming starchy, ovate; germ midsized; crease midwide, shallow; cheeks angular; brush midsized, short.

This variety differs from Titanic in having red kernels.

History.—Winter Alaska was obtained from the Washington Agricultural Experiment Station, Pullman, Wash., in 1917. It was grown by that station for several years previous, but its previous history could not be traced.

Distribution.—Grown in experiments at experiment stations in Washington and commercially to a small extent in the vicinity of Puyallup, Pierce County, Wash.

DURUM WHEAT.

The plants of durum wheat usually are of spring habit and tall. The peduncle is pithy, at least in the upper portion. The spikes are compact and laterally compressed, and hence are narrower when seen in a face view. The glumes are persistent, sharply keeled, and the lemmas always awned except in a few awnless forms recently originated by hybridization. The awns are long and coarse and are white, yellow, brown, or black. The kernels are white or red and usually rather long and pointed; they are very hard and translucent, making the white-kerneled forms appear amber-colored. The kernels always have a short brush and angular cheeks and are the hardest of all known wheats.

The durum wheats, as before stated, are sometimes very similar to certain poulard varieties. The spikes, however, usually are much thinner, the glumes are longer, and the kernels are longer, more slender, and usually much harder.

Durum wheat has been widely grown in the United States only during the past 20 years. Most of the varieties were introduced from southern Russia and the Mediterranean region, where these wheats principally are grown. Certain introductions, including Kubanka, made by the Department of Agriculture about 1900, became popular with farmers in the northern Great Plains and Prairie sections and the production rapidly increased. The distribution of durum wheat in 1919 is shown in Figure 75. The durums furnish the great bulk of the world's supply of wheat for the manufacture of semolina, macaroni, and spaghetti. The production of durum wheat in the United States made possible a large macaroni industry, which now uses about a third of the national production of this wheat. The remainder is exported or used by American mills or bakeries for mixing with other wheats or flour for bread making.

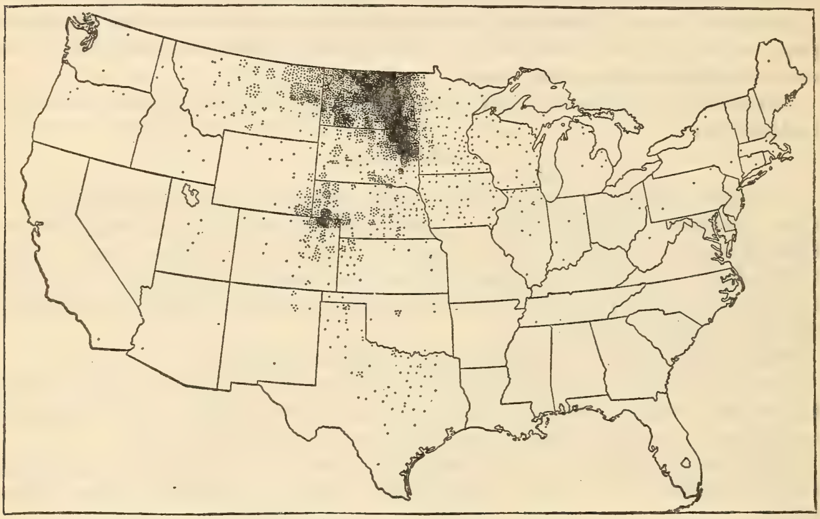


FIG. 75.—Outline map of the United States, showing the distribution of durum wheat in 1919. Estimated area, 4,340,000 acres.

The varieties that are commercially grown are distinguished by the accompanying key.

KEY TO THE VARIETIES OF DURUM WHEAT.

- 1a. Spike Awned.
  - 2a. Glumes Glabrous.
    - 3a. Glumes White.
      - 4a. Awns White.
        - 5a. Kernels Red (*Triticum durum affine* Kcke.). Page.
          - Kernels Midlong, Hard........................Pentad..................... 185
      - 4b. Awns Black.
        - 5a. Kernels White (Amber) (*T. d. leucomelan* Al.).
          - Kernels Very Long, Hard...................... Peliss..................... 186
    - 3b. Glumes Yellow.
      - 4a. Awns White.
        - 5a. Kernels White (*T. d. hordeiforme* Host.).
          - Kernels Long, Hard.
            - Spike fusiform.
              - Plant midtall; beaks 1-2 mm. long.........Acme....................... 186
                - Monad..................... 187
              - Plant tall; beaks 1-5 mm. long.............Arnautka................... 187
                - Mindum..................... 188
            - Spike oblong; plant tall.
              - Beaks 1-2 mm. long.........................Kubanka.................... 189
                - Kubanka No. 8............ 190
                - Buford..................... 190
              - Beaks 1-10 mm. long........................Marouani................... 190

- 1a. Spike Awned—Continued.
  - 2b. Glumes Pubescent.
    - 3a. Glumes White.
      - 4a. Awns Black.
        - 5a. Kernels White (*T. d. melanopus* Al.).
          - Kernels Long, Hard. Page.
            - Beaks 1-2 mm. long........................Velvet Don.............. 191
            - Beaks 1-5 mm. long........................Golden Ball.............. 191
    - 3b. Glumes Black.
      - 4a. Awns Black.
        - 5a. Kernels White (*T. d. taganrogense* Desv.).
          - Kernels Long, Hard.
            - Beaks 1-2 mm. long........................Kahla.............. 192

DESCRIPTIONS, HISTORY, DISTRIBUTION, AND SYNONYMY OF DURUM WHEAT VARIETIES.

PENTAD (D–5).

Description.—Plant spring habit, midseason, midtall; stem white, midstrong; spike awned, fusiform, middense, inclined; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique to elevated; beaks 1 to 2 mm. long; awns white, 5 to 15 cm. long; kernels red, midlong, hard, ovate, truncate tip, humped; germ midsized; crease midwide, shallow; cheeks angular; brush midsized, short.

The Pentad or D–5 (Durum No. 5) variety is distinct from all other commercial varieties of durum wheat grown in the United States because of its red kernels. They are smaller, squarer at the brush end, and more pointed at the germ end than kernels of the other durum varieties. Experiments have shown it to be the most rust-resistant variety of wheat grown in the United States, and therefore it yields well under conditions favoring rust. Its milling and baking value, however, has been found to be inferior to other durum varieties. A spike, glumes, and kernels of Pentad wheat are shown in Plate LV, *A*.

History.—The Pentad variety was introduced from Russia in 1903 by Prof. H. L. Bolley, of the North Dakota Agricultural Experiment Station. The wheat was distributed in several sections of North Dakota by Professor Bolley in the spring of 1911. Because of its rust resistance it gained popularity and has recently become widely distributed in the durum-wheat section, but its poor milling quality has caused its distribution to be opposed by many agencies. The name Pentad is derived from penta, meaning five in Greek, plus *d*, which stands for durum. The name was suggested to the North Dakota station by the senior writer in 1917. It has recently been used by Professor Bolley as a name for D–5, and was first recorded by Trowbridge (*196*, p. 17) in 1920.

Distribution.—Pentad was reported in 1919 from Minnesota, Montana, Nebraska, North Dakota, South Dakota, and Wyoming. It is grown principally in North Dakota.

Synonyms.—"D–fife," Ladd Durum, Red Durum, Resistant Fife, and Rust Proof.

The name "D–fife" is often but wrongly used by many farmers in North Dakota. The practice is easily accounted for, as the numeral 5 has been mispronounced as fife. Ladd Durum is a name used in the grain trade for Pentad wheat under the supposition that Dr. E. F. Ladd, formerly of the North Dakota Agricultural College, was the originator. Red Durum is a name commonly used for Pentad wheat, as it is the name of the subclass under which the grain of this wheat is graded under the Official Grain Standards. Resistant Fife and Rust Proof are names used for Pentad wheat on the farms, because the variety has proved to be resistant to stem rust.

PELISS (PELISSIER).

Description.—Plant spring habit, midseason, tall; stem white, midstrong; spike awned, broadly fusiform, middense, inclined; glumes glabrous, white, long, wide; shoulders narrow to midwide, oblique to elevated; beaks 1 to 5 mm. long; awns black, 6 to 18 cm. long; kernels white (amber), very long, hard, elliptical, curved, humped; germ midsized; crease midwide, middeep; cheeks angular; brush small, short.

Peliss is distinct from Kubanka in having white rather than yellowish glumes, black awns, and very long kernels, which are somewhat curved. It is a high-yielding and drought-resistant variety in the higher and drier sections of Montana and Wyoming. A spike, glumes, and kernels of Peliss are shown in Plate LV, *B*.

History.—The Peliss (Pelissier) (*197*, S. P. I. No. 5380) variety was introduced from Mustapha, Algiers, Algeria, by W. T. Swingle, of the United States Department of Agriculture, in 1900. The variety, presumably of Spanish origin, is widely distributed throughout northern Africa, where it is grown under many different names. According to Scofield (*172*, p. 38) the original seed was obtained from a man named Pelissier, who lived near Ponts des Issers in the western part of the Province of Oran and who did some work in selection to improve the yield of this variety. In the United States the variety was first called Pelissier, but the name was usually mispronounced, so the shorter and simpler form, Peliss, was substituted in 1920 (*66*, p. 10).

Distribution.—Grown in experiments in the northern Great Plains area and commercially in Montana, North Dakota, and Wyoming.

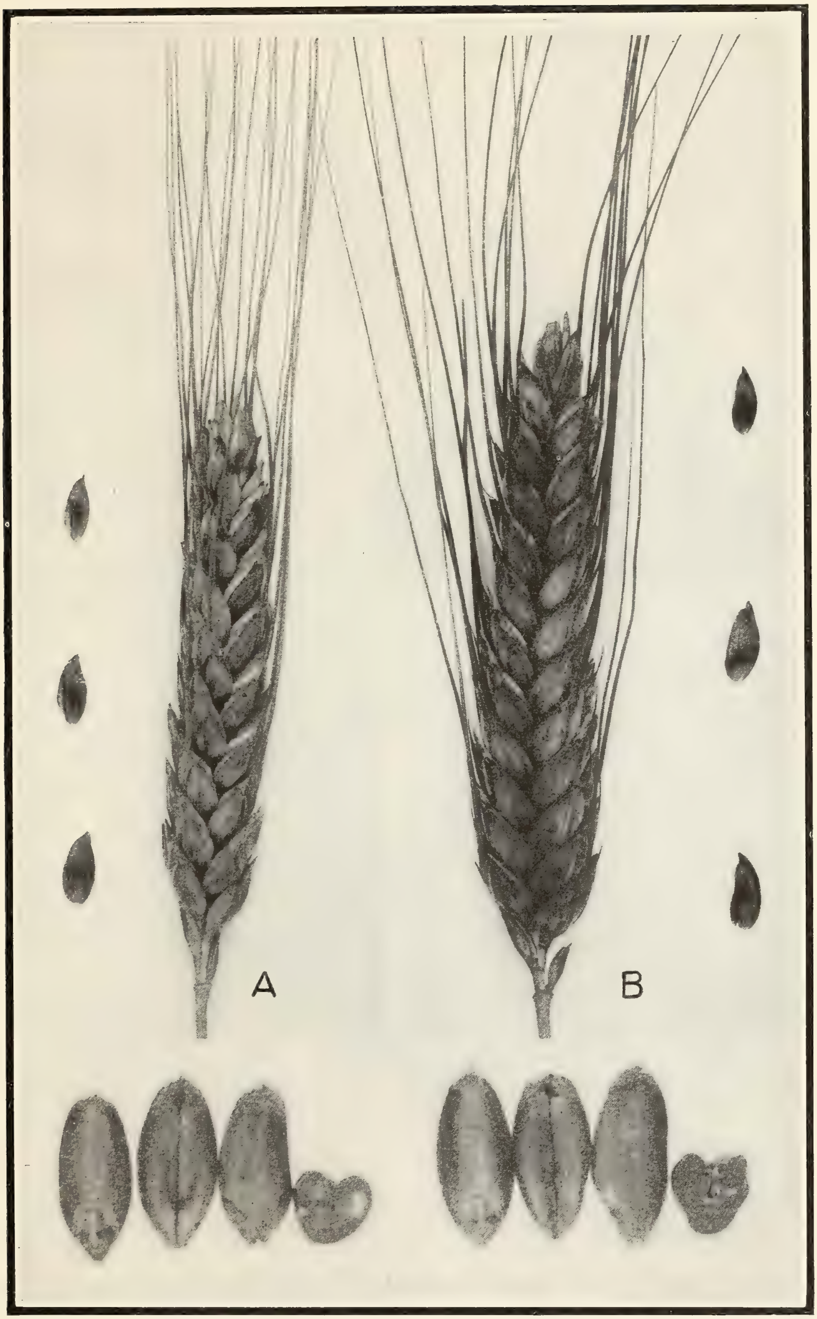
Synonym.—Black-Bearded durum. This name is used for Peliss by some growers in North Dakota not acquainted with its correct name.

ACME.

Description.—Plant spring habit, midseason, midtall; stem white, weak to midstrong; spike awned, fusiform, middense, inclined to nodding; glumes glabrous, yellowish, midlong, midwide; shoulders midwide, usually oblique; beaks broad, incurved, 1 mm. long; awns yellowish, 5 to 15 cm. long; kernels white (amber) midlong to long, hard, elliptical to ovate; germ midsized; crease midwide, shallow; cheeks angular; brush midsized, short.

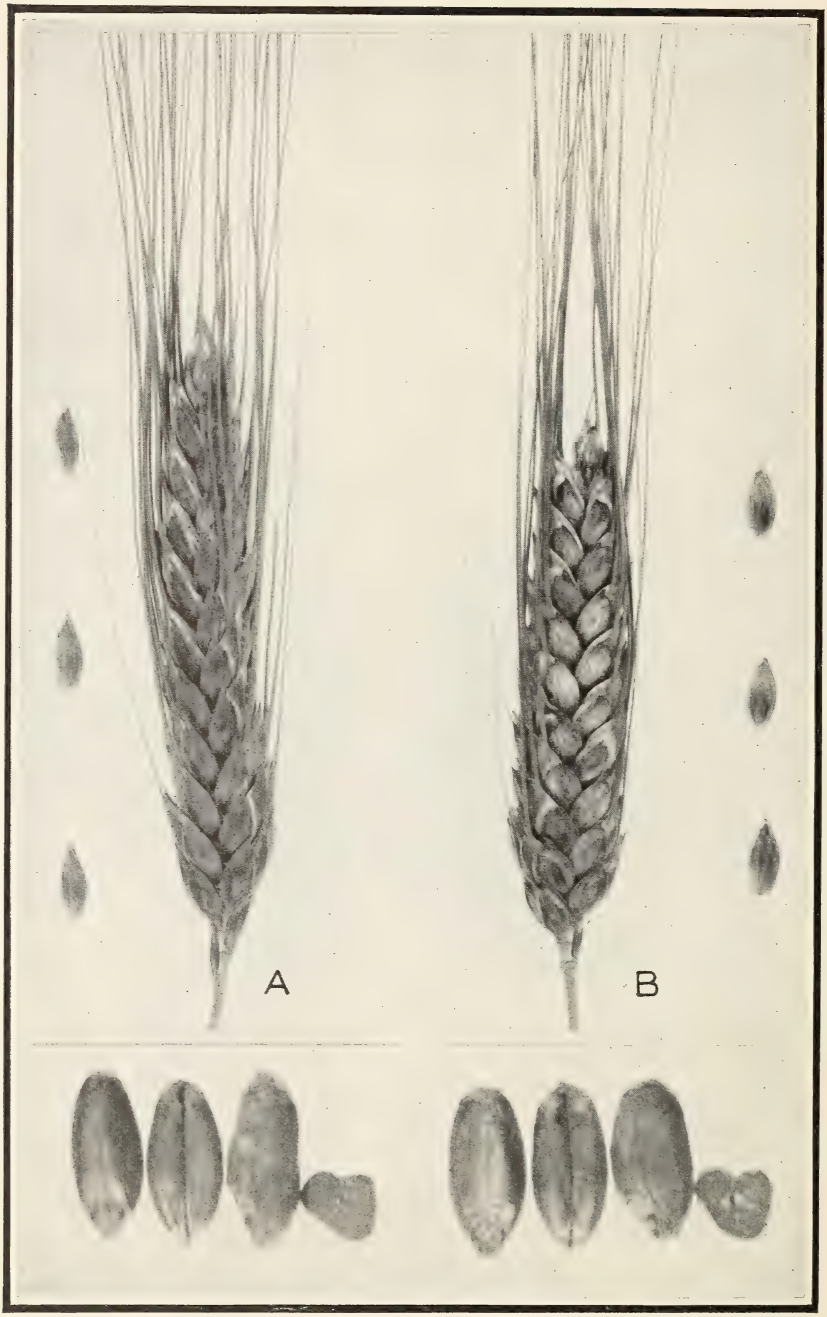
Acme differs principally from Kubanka in being shorter, in having weaker straw, and a longer, laxer, and narrower spike. It is very resistant to stem rust and is a high-yielding variety. A spike, glumes, and kernels of Acme are shown in Plate LVI, *A*.

History.—The Acme variety originated as a pure-line selection from Kubanka (C. I. No. 1516) made by Manley Champlin, a representative of the United States Department of Agriculture, in cooperative experiments with the South Dakota Agricultural Experiment Station at the Highmore Substation, Highmore, S. Dak., in 1909. The selection was first known as No. 7. By 1914 it had been increased from the breeding nursery to the plats because of its high yields, and in 1916 it was grown commercially. In the rust epidemic of that year it was discovered to be resistant to stem rust. As it differs from the true Kubanka, it was given a distinctive name. The strain of Kubanka from which the Acme was selected was obtained by the United States Department of Agriculture at the Paris Exposition, in 1900. The seed came from the Samara Government, Russia. Although introduced and grown under the name of Kubanka, this lot is not identical with the true Kubanka and is much like Acme, but was not pure or as resistant to rust.



ACME (A). KAHLA (B).

Spike, side view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.



ARNAUTKA (A). KUBANKA (B).

Spike, side view, natural size; glumes from lower, central, and upper portions of spike, natural size; kernels in three positions and in transverse section, magnified 3 diameters.

Distribution.—Acme is grown in experiments at experiment stations in the northern Great Plains area and commercially in North Dakota, South Dakota, and Wyoming.

MONAD.

Description.—The Monad variety is very similar to Acme, differing principally in having somewhat stronger stems and shorter awns. It is as resistant to stem rust as Acme and usually yields better than Acme in North Dakota, and the grain is of better milling quality.

History.—Monad wheat was introduced in 1903 from the Saratov Government, Russia, 100 versts east of Volga (unpublished S. P. I. No. 10207), by Prof. H. L. Bolley, of the North Dakota Agricultural Experiment Station, while making a study of the flax industry of Europe for the United States Department of Agriculture. Seed of the variety was distributed by Professor Bolley to several farmers and to the Dickinson and Langdon substations as D–1 (Durum No. 1) in 1911. Its identity on the farms nearly became lost. In 1917 it was named Monad by Ball and Clark (*42*, p. 44) after it was found in experiments at the Dickinson substation, Dickinson, N. Dak., to be a high-yielding variety and one resistant to stem rust. The name is derived from mono, root of the Greek word one, plus *d*, which stands for durum. It was increased at the Dickinson substation from 1918 to 1920 for commercial distribution. In 1920 R. S. Goodhue (*96*), county agent, of Stutsman County, N. Dak., reported finding the variety commercially grown in his county from one-half bushel of seed originally furnished O. J. Seiler, of Stutsman County, by Professor Bolley in 1911. August Clemens, of Lenton Township, obtained seed from Mr. Seiler and increased and grew it until 1919, when he brought it to the attention of County Agent Goodhue, who distributed 3,700 bushels among farmers in Stutsman County in the spring of 1920.

Distribution.—The Monad variety is grown in experiments at experiment stations in the northern Great Plains and commercially in North Dakota.

Synonym.—D–1. As shown above, this is the designation under which Professor Bolley first distributed seed of the Monad variety. It is still used as a name for the variety in Stutsman County, N. Dak., where it is grown to a considerable extent.

ARNAUTKA.

Description.—Plant spring habit, midseason, tall; stem white, midstrong; spike awned, fusiform, middense, nodding; glumes glabrous, yellowish, midlong, midwide; shoulders narrow, usually oblique; beaks wide, 1 to 5 mm. long; awns yellowish, 6 to 18 cm. long; kernels white, long, hard, elliptical; germ midsized; crease midwide, shallow; cheeks angular; brush midsized, short.

Arnautka differs from Kubanka in having a longer, narrower, and laxer spike, which usually is more nodding when ripe. A spike, glumes, and kernels of Arnautka wheat are shown in Plate LVII, *A*.

History.—The first importation of Arnautka wheat made by the United States Department of Agriculture was in 1864 (*157*). It was grown in 1865 with other varieties of wheat on what are now the grounds of the Department of Agriculture, near Fourteenth Street, Washington, D. C. (*42*, p. 3). It was distributed to several sections of the United States, but as far as known never became commercially established. The basis for the present commercial stock is thought to have been brought by early immigrants from Russia to North Dakota (*58*, p. 40), where it was called Wild Goose. Distribution from this source by the Department of Agriculture dates from 1900, when seed (C. I. No. 1494) was obtained from T. N. Oium, of Lisbon, N. Dak. This seed was distributed with Kubanka and other varieties. The variety, however, had previously become established in southeastern North Dakota, where it early proved to be well adapted. A pure-line selection (C. I. No. 4064) from this mass variety, developed at the Akron Field Station, Akron, Colo., has recently been grown at most agricultural experiment stations in the northern Great Plains and distributed somewhat.

Distribution.—Durum wheat was reported in 1919 from 29 States, but the proportion of this which Arnautka represents can not be determined. The variety is extensively grown, however, in Colorado, Minnesota, Montana, North Dakota, South Dakota, Texas, and Wyoming.

Synonyms.—Goose, Johnson, Nicaragua, Pierson, Wild Goose.

Goose and Wild Goose are names commonly used for Arnautka, or durum wheat in general, particularly by the grain trade, during the early years of durum-wheat cultivation in the United States. There is a tradition that the seed was originally obtained from the crop of a wild goose.

Johnson is a name under which Arnautka was reported from Michigan. The name is also in use in Iowa, Minnesota, South Dakota, and Wisconsin, but not usually for the Arnautka variety.

Nicaragua is a name used for Arnautka durum wheat in the southern Great Plains, particularly Texas. The source of this wheat is not known. In discussing its origin Carleton (*58*, p. 40) mentioned "one would infer from the name that it came from Nicaragua." It became grown throughout northern Texas in the early nineties and it is still grown there to a considerable extent. It is identical with the Arnautka variety.

Pierson is the name under which a selected lot of durum wheat identical with Arnautka has been distributed by George H. Pierson, of Claremont, S. Dak., with the claim that it was a rustproof durum wheat. Concerning this wheat, Mr. Pierson has written as follows:[31]

> I obtained the seed 17 years ago (1897) from an immigrant who was driving through the State of South Dakota and using it for horse feed. The man was from Kansas and said that they used this wheat for horse and hog feed there. I raised it for some years as a horse and hog feed and then commenced to breed it. It is rustproof with a large head and hardy stiff straw. It outyields all other varieties.

MINDUM.

Description.—Mindum is similar to Arnautka, except for being slightly earlier, in having slightly weaker straw, narrower glumes, longer awns, a shorter or nearly absent brush, and in being more resistant to stem rust.

History.—Mindum was first grown in 1896 in a centgener nursery at University Farm, St. Paul, Minn., as a selection from wheat which was called "Hedgerow," by the Minnesota station.

The statement was made in the Minnesota accession book that it was a head selection from a field of common wheat. It proved to be a rust-resistant strain at University Farm, and was tested at the substations. It was a high-yielding wheat in experiments conducted at the Northwest substation at Crookston, Minn., during the years 1913 to 1916. The variety was named Mindum (a contraction of Minnesota durum) in 1918 (*106*, p. 33), for the purpose of distinguishing it from the commercial Arnautka.

Distribution.—Mindum was first distributed for commercial sowing in 1917 from University Farm, St. Paul, and from the Northwest substation, Crookston, Minn. Grown especially in Kittson and Red Lake Counties, Minn.

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[31] Correspondence of the Office of Cereal Investigations, dated May 30, 1914.

KUBANKA.

Description.—Plant spring habit, midseason, tall; stem white, midstrong; spike awned, broadly oblong, dense, inclined to nodding; glumes glabrous, yellowish, midlong, wide; shoulders midwide, usually rounded; beaks wide, 1 mm. long; awns yellowish, 6 to 15 cm. long; kernels white (amber), large, hard, elliptical; germ midsized; crease midwide, shallow; cheeks angular; brush midsized, short.

Kubanka is a high-yielding variety and is more resistant to stem rust than Arnautka. It differs from Arnautka in having shorter, denser, and more erect spikes, and shorter beaks and kernels. It also is a better milling variety than Arnautka. A spike, glumes, and kernels of Kubanka wheat are shown in Plate LVII, *B*, and a single spike in Plate IV, Figure 6.

History.—The Kubanka variety is of Russian origin. More than a dozen importations into the United States have been made. The principal introduction of the variety was made in 1900 by M. A. Carleton, of the United States Department of Agriculture, from Uralsk Territory, Russia (*197*, S. P. I. No. 5639). The original seed of this introduction was grown under contract in New Mexico and South Dakota in 1901, and the following year 200 bushels of seed were distributed to many growers. The distribution was continued by the Department up to 1909. Aside from the distribution made by the United States Department of Agriculture, both the North Dakota and South Dakota experiment stations distributed large quantities to growers. The Kubanka first proved specially well adapted to the drier western portions of the Great Plains area. In recent years it has proved well adapted to the more humid sections also and is now considered the best adapted of the durum varieties to all of the varying conditions in the northern spring-wheat section of the United States.

Distribution.—Grown in Colorado, Minnesota, Montana, North Dakota, South Dakota, Wisconsin, and Wyoming. Durum wheat was reported from a dozen other States in 1919, but it can not be determined just what proportion of the distribution shown is of the Kubanka variety.

Synonyms.—Beloturka, Gharnovka, Pererodka, Taganrog, and Yellow Gharnovka.

Beloturka (meaning white Turk) is of Russian origin and, like Kubanka, has also been introduced into the United States many times. The wheat received under this name has proved to be similar to Kubanka. In both Russia and Algeria, where Beloturka wheat is widely grown, the name is used as synonymous with Kubanka.

The Gharnovka variety was obtained in two lots (*197*, S. P. I. Nos. 5643 and 5646) from Taganrog, Territory of the Don Cossacks, Russia, by M. A. Carleton, for the United States Department of Agriculture in 1900. These both proved to be very similar to Kubanka, and they were grown in experiments in the northern Great Plains for a number of years, but have now been discontinued at most points because they did not prove to be superior to Kubanka in yield.

Pererodka was first obtained by M. A. Carleton, for the United States Department of Agriculture in 1899 from the Orsk district, Orenburg Government, Russia (*197*, S. P. I. No. 2954). Concerning the name of this wheat Carleton (*59*, p. 18) has written as follows:

> This wheat is very closely allied to Kubanka. The word Pererodka means something regenerated or degenerated. In the case of its application to this sort of wheat, it is apparently understood to have the latter meaning. As already stated, when Kubanka wheat, by transference to darker soil, becomes softer and darker grained, it is called Pererodka.

The Pererodka variety was grown in experiments for a number of years in the northern Great Plains and appeared to be identical with Kubanka in all respects.

Taganrog (*197*, S. P. I. No. 5355) is the name under which a wheat similar to Kubanka was obtained from Marseilles, France, in 1900, by W. T. Swingle, of the United States Department of Agriculture. This is not a varietal name in France, but rather the name of a port of Russia, and the sample introduced was probably a bulk lot of seed shipped from Taganrog.

Yellow Gharnovka (*197*, S. P. I. No. 5642) has the same history as Gharnovka discussed above.

KUBANKA NO. 8.

Description.—Kubanka No. 8 is a selection from Kubanka, identical in appearance but a better yielder in western North Dakota. It is much more susceptible to stem rust than the unselected Kubanka and principally for that reason has not yielded well over a wider area.

History.—Kubanka No. 8 (C. I. No. 4063) is a pure-line selection from Kubanka (C. I. No. 1440) made in 1906 by Prof. L. R. Waldron, now of the North Dakota Agricultural Experiment Station, at the Dickinson Substation, Dickinson, N. Dak., where it proved to be a high-yielding strain (*64*, p. 17).

Distribution.—It was distributed to growers in the vicinity of Dickinson as early as 1911, and has been grown commercially since in western North Dakota and at most experiment stations in the northern Great Plains area.

BUFORD.

Description.—Buford is similar to Kubanka, except that it has a slightly narrower and laxer spike. It proved to be a high-yielding variety at the Williston substation, Williston, N. Dak., but it has a gluten of poor quality, as shown by a small loaf volume.

History.—Buford is the result of a pure-line selection made by F. R. Babcock, a representative of the United States Department of Agriculture, at the Williston substation, Williston, N. Dak., in 1909. This selection was made from a plat of Taganrog. It was first grown in plat experiments in 1913, when it outyielded all other varieties grown. It continued to yield well and in 1917 was given the name Buford, from the Buford-Trenton Reclamation Project, on which the Williston substation is located, and was distributed (*42*, p. 46).

Distribution.—Grown in Williams and Divide Counties, N. Dak., and in Montana.

MAROUANI.

Description.—Plant spring habit, midseason, very tall; stem white, weak; spike awned, broadly oblong, dense, nodding; glumes glabrous, yellowish, midlong, wide; shoulders narrow, usually elevated; beaks wide, 1 to 15 mm. long; awns yellowish, 8 to 20 mm. long; kernels white (amber), very long, hard, elliptical, humped; germ large; crease midwide, shallow to middeep; cheeks angular; brush small, short.

History.—Marouani wheat (*197*, S. P. I. No. 7578) was introduced from the Province of Oran, Algeria, in 1901, through D. G. Fairchild and C. S. Scofield, for the United States Department of Agriculture. Concerning the introduction, they have written as follows:

> This wheat is cultivated extensively on the elevated rolling lands in the western part of the Province and is one of the best of the types of durum wheats cultivated by the Arabs. The quantity obtained is from the estate of M. J.

Labouresse, at Tessala, near Sidi bel Abbes. It has been carefully selected by Mr. Labouresse from year to year until a fairly pure and very vigorous stock has been obtained. The variety is very hardy, resistant to rust, and succeeds fairly well under rather droughty conditions. The grain is especially adapted for the manufacture of semolina. In the Province of Oran the wheat is sown in November and ripens in June, but it might succeed as a spring wheat in the spring-wheat region of the northern United States.

In experiments in the United States Marouani wheat proved best adapted to the central and southern Great Plains.

Distribution.—Marouani has been distributed from the Hays Branch Station, Hays, Kans., and the Amarillo Field Station, Amarillo, Tex. The extent of its present distribution is not known, as it was not reported in the varietal survey.

VELVET DON.

Description.—Plant spring habit, midseason, midtall; stem white, midstrong; spike awned, fusiform, middense, inclined; glumes pubescent, white, midlong, midwide; shoulders narrow, oblique to elevated; beaks wide, 1 to 1.5 mm. long; awns black, 6 to 15 cm. long; kernels usually white (amber) midlong to long, hard, ovate to elliptical, humped; germ midsized; crease midwide, shallow to middeep; cheeks angular; brush midsized, short.

Velvet Don as originally introduced was a mixture as to kernel color, a considerable percentage of red kernels being present. It has sometimes been described as a red-kerneled variety. That which is grown now, however, is usually white kerneled.

History.—Velvet Don (*197*, S. P. I. No. 5644) was introduced from Ambrocievka, 20 miles northeast of Taganrog, in the Don Territory, Russia, in 1900, by M. A. Carleton, for the United States Department of Agriculture. Experiments with Velvet Don in the United States have proved it to be only a mediocre yielder, and it now is largely discontinued in experiments.

Distribution.—Seed of the variety was distributed by the Department at various times in the early nineties and the variety is commercially grown to a limited extent in Montana and Nebraska.

GOLDEN BALL.

Description.—Plant spring habit, midseason, short to midtall; stem white, midstrong; spike awned, oblong-fusiform, dense, inclined; glumes pubescent, white, midlong, midwide; shoulders narrow, oblique to elevated; beaks 1 to 5 mm. long; awns black, 5 to 18 cm. long; kernels white, long, hard, ovate, humped; germ large; crease midwide, shallow to middeep; cheeks angular; brush small, short.

History.—Golden Ball (*197*, S. P. I. No. 46766) was introduced by the United States Department of Agriculture in 1918, from Johannesburg, South Africa. The seed was purchased through J. Burtt Davy from the Agricultural Supply Association. Three previous introductions of wheat under the name of Golden Ball had been made by the department from South Africa. These wheats all resemble this introduction, except that they had red instead of white kernels. The Golden Ball is reported to be extensively grown in South Africa and is recognized as a valuable drought-resistant and rust-resistant variety.

Distribution.—Seed of the introduction discussed above has been distributed to field stations of the Office of Cereal Investigations in the northern Great Plains and Pacific Northwest. It is not grown commercially.

KAHLA.

Description.—Plant spring habit, midseason, tall; stem white, midstrong; spike awned, oblong-fusiform, middense, nodding; glumes finely pubescent. black, midlong, midwide; shoulders narrow, usually oblique; beaks wide, 1 to 2 mm. long; awns black, 6 to 16 cm. long; kernels white (amber) midlong to long, hard, elliptical, humped; germ midsized; crease midwide, middeep; cheeks angular; brush midsized, short.

A spike, glumes, and kernels of Kahla are shown in Plate LVI, *B*.

History.—The Kahla variety (*197*, S. P. I. No. 7794) was introduced in 1901 by Messrs. D. G. Fairchild and C. S. Scofield, from Setif, Constantine Province, Algeria, for the United States Department of Agriculture. Concerning the variety they recorded the following information:

> This is one of the wheats commonly grown by Arabs throughout Algeria. As the name Kahla signifies, this is a black-chaffed sort. It is generally considered to be one of the best of the Algerian wheats for adaptability to a wide variety of adverse conditions. When such are favorable it produces grain of excellent quality for macaroni manufacture. Under certain favorable climatic conditions the chaff loses color somewhat, but under native culture on the gravelly hills of Algeria or in the semiarid plains the purple-black of the chaff is a striking feature. This seed is furnished the department by Mr. G. Ryf, manager of the Geneva Society of Setif. Commonly planted in November or December and harvested in June or July.

Experiments with Kahla wheat showed it to be a fairly good yielding variety, but not superior to Kubanka.

Distribution.—After being grown in experiments for a series of years in many sections of the northern Great Plains, its culture largely has been discontinued. Small lots are known to have been distributed, however, and apparently the wheat has become established on farms, especially in Montana, North Dakota, and South Dakota, and known by various names.

Synonyms.—Black Don, Black Durum, Black Emmett, Black Swamp, Purple Durum, Red Swamp, and Sloat.

Black Don (*197*, S. P. I. No. 5645) is a wheat similar to Kahla except that (like Velvet Don) it usually is mixed in kernel color, a considerable percentage of red kernels being present. The variety is of Russian origin. It was introduced in 1900, from Ambrocievka, 20 miles northeast of Taganrog, in the Don Territory, Russia, by M. A. Carleton for the United States Department of Agriculture. In experiments in the United States this variety did not prove superior to Kubanka and it now largely has been discontinued. It is possible, however, that this variety may be commercially grown.

Black Durum is the name under which wheat similar to Kahla is commercially grown in Montana. Its distribution apparently started from Fergus County. Black Emmett is the name commonly used for a wheat, apparently similar to Kahla, in North Dakota, the distribution of which apparently started in Hettinger County. Purple Durum is a name used for Kahla in Wyoming. Black Swamp and Red Swamp are names under which a wheat practically identical with Kahla was obtained from Morrow County, Oreg., where it is grown to a very small extent. Sloat descended from a head selection made by Sloat Bros., of Gettysburg, S. Dak. They state that a single head of black-chaff wheat was found in a commercial field of Kubanka, and from this originated the wheat they have been growing and distributing as Sloat. This strain apparently is identical with Kahla. Its distribution dates from 1917.

EMMER.

Emmer is often incorrectly called "Speltz" in the United States. The word emmer is German, but it has come into use in America, as there is no English name for this wheat ally. Emmer may be of either winter or spring habit and usually is awned. The culms often are pithy within and the leaves usually are pubescent. The rachis is brittle. The spikes are very dense and laterally compressed, being narrow when viewed from the face of the spikelet and wide from the edge view. The pedicel (joint of rachis) is short, narrow, and pointed, and remains attached to the base of the spikelet which it bears. The spikelets are flattened on the inner side and usually contain two flowers. The kernels, which remain inclosed in the glumes after thrashing, are red, long, and slender with both ends acute.

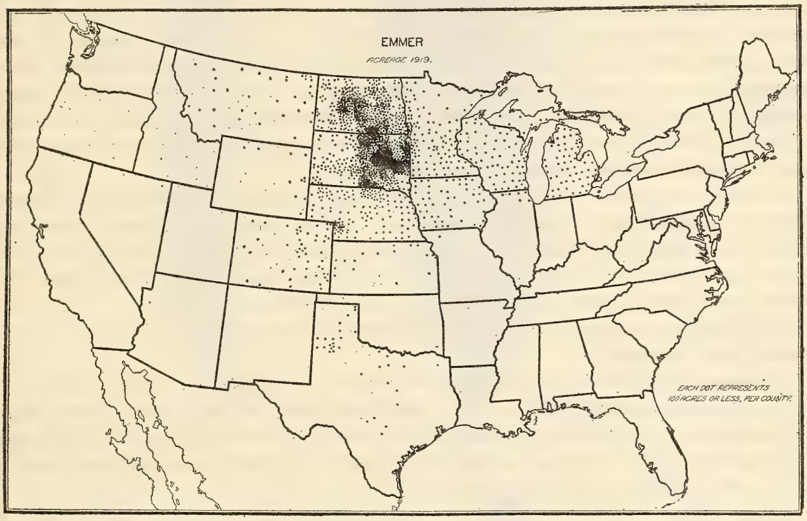


FIG. 76.—Outline map of the United States, showing the distribution of emmer in 1919, according to the United States Census. Estimated area, 166,829 acres. Each dot represents 100 acres or less, per county.

Emmer is distinguished from spelt by the shorter, denser spikes, which are laterally compressed. The pedicel of emmer is shorter and narrower and is usually attached to the base of the spikelet which it bears, while in spelt the pedicel remains attached to the face of the next lower spikelet. The inner side of the spikelet is flat instead of arched, and the kernel usually is of a darker red color than that of spelt.

Practically all of the emmer grown in the United States is used as feed for live stock. Some winter emmer, however, is used in the manufacture of breakfast food. The distribution of emmer in 1919 is shown in Figure 76.

KEY TO THE VARIETIES OF EMMER.

SPIKE AWNED. Page.
GLUMES GLABROUS.
GLUMES WHITE (*Triticum dicoccum farrum* Bayle).
SPRING HABIT.
Straw white.
Plant early, short ____________________ KHAPLI __________ 194
Straw purple.
Plant late, midtall ____________________ VERNAL __________ 194
GLUMES PUBESCENT.
GLUMES BLACK (*T. d. atratum* Al.).
WINTER HABIT ______________________________ BLACK WINTER ___ 195

DESCRIPTIONS, HISTORY, DISTRIBUTION, AND SYNONYMY OF EMMER VARIETIES.

KHAPLI.

Description.—Plant spring habit, early, short; stem white, midstrong; spike awned, broadly oblong, middense, inclined; glumes glabrous, white, midlong, narrow; shoulders midwide, oblique to elevated; beaks wide, obtuse, 0.5 mm. long; awns white, 2 to 12 cm. long; kernels red, long, hard, elliptical, acute, humped, curved, usually remaining in the glumes when thrashed; germ small; crease narrow to midwide, shallow; cheeks usually rounded; brush small, long.

Khapli differs from the common White Spring emmer chiefly in being earlier and in having shorter stems and wider spikes.

History.—A sample of this emmer was first obtained in 1908 by the Department of Agriculture from Hoshungabad, Central Provinces, India. Seed was grown at University Farm, St. Paul, Minn., and the variety has proved of interest and value for breeding, because of its immunity from stem rust. The variety has yielded well in experiments in South Dakota.

Distribution.—Grown to a slight extent in South Dakota and at several experiment stations.

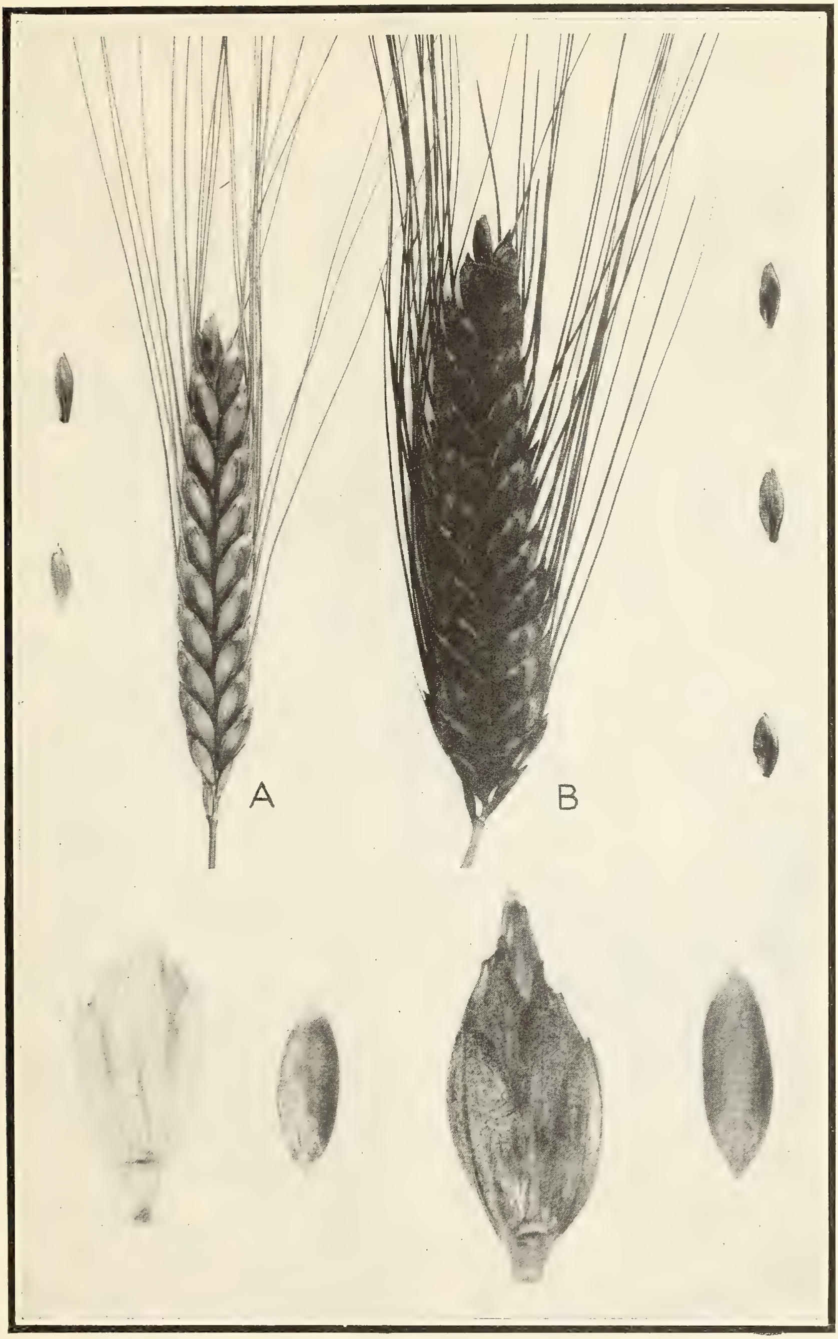
Synonym.—Kathiawar is an emmer similar to Khapli. It was obtained in 1914 and again in 1915 (*197*, S. P. I. Nos. 39227 and 40919) by the United States Department of Agriculture, from the district of Kathiawar, north of Bombay. It is said to grow wild in Kathiawar, a very dry district on the west coast of India, but there is no proof of this.

VERNAL (WHITE SPRING.)

Description.—Plant spring habit, late, midtall; stem purple, midstrong; spike awned, fusiform, middense, nodding; glumes glabrous, white, midlong, midwide; shoulders midwide, oblique; beaks wide, obtuse, 0.5 mm. long; awns white, 2 to 12 cm. long; kernels red, long, hard, ovate to elliptical, acute, humped, usually remaining in the glumes when thrashed; germ small; crease narrow to midwide, shallow; cheeks usually rounded; brush small, long.

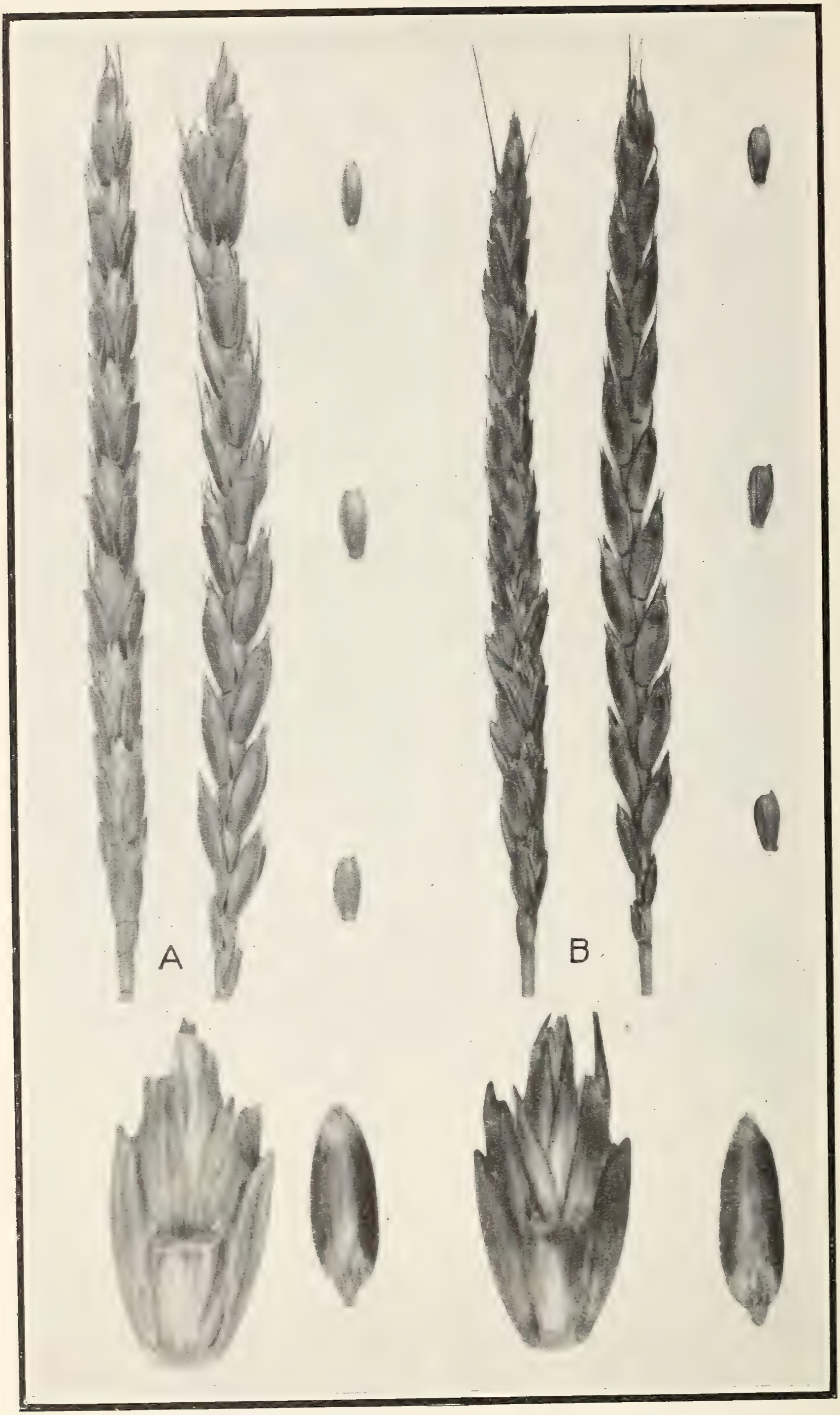
A spike, glumes, a spikelet, and kernel of Vernal (White Spring) emmer are shown in Plate LVIII, *A*.

History.—The origin of emmer dates from prehistoric times. In historic times it seems to have been cultivated first in Switzerland. It is now grown extensively in Germany and Russia, where the White Spring emmer as above described is the most common variety. It is not known when this variety was first brought to the United States, but it was grown by farmers in the northern Great Plains States probably as early as 1875. In recent years its cultivation has greatly increased. It has long been called White Spring, but is here named Vernal.



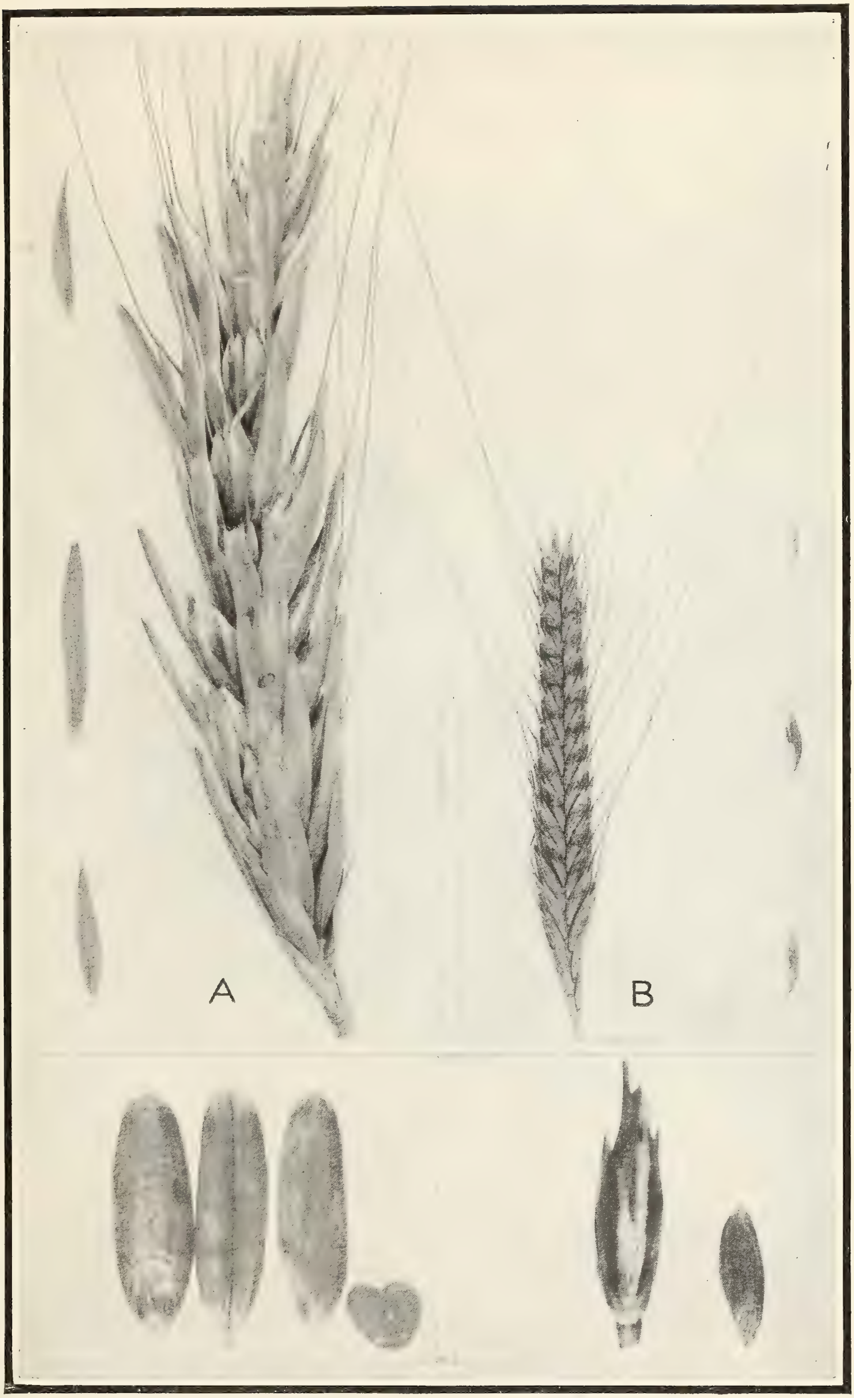
VERNAL EMMER (A). BLACK WINTER EMMER (B).

Spike, side view, natural size; glumes from lower, central, and upper portions of spike, natural size; spikelet and kernel, magnified 3 diameters.



WHITE SPRING SPELT (A) RED WINTER SPELT (B).

Spikes, face and side views, natural size; glumes from lower, central, and upper portions of spike, natural size; spikelet and kernel, magnified 3 diameters.



WHITE POLISH (A). EINKORN (B).

Spike, side view, natural size; glumes from lower, central, and upper portion of spike, natural size; wheat kernels in three positions and in transverse section, magnified 3 diameters; einkorn spikelet and kernel, magnified 3 diameters.

Distribution.—Grown to a considerable extent in Minnesota, North Dakota, South Dakota, and to a lesser extent in Colorado, Kansas, Montana, Nebraska, Oklahoma, Texas, and Wyoming.

Synonyms.—" Speltz " and Yaroslav emmer.

" Speltz " is the name under which White Spring emmer usually is advertised and sold by seedsmen in the Great Plains States. It usually is known by that name on the farms also. This term is incorrectly used, and the name does not exist as a legitimate word in any language. What is meant is the German word Spelz, which is spelled differently and which is translated spelt in English. The confusion between emmer and spelt is thought to have arisen in Germany, where considerable quantities of both cereals are grown.

Yaroslav emmer (*197*, S. P. I. No. 2789) was obtained from the Government of Yaroslav, Russia, in 1899, by M. A. Carleton, for the United States Department of Agriculture. Experiments with this introduction in the United States have shown it to be practically identical with White Spring emmer. As it has not outyielded the White Spring emmer in experiments, it has not become commercially grown.

BLACK WINTER.

Description.—Plant winter habit, late, tall; stem white, strong, stout; spike awned, broadly fusiform, middense to dense, inclined; glumes pubescent, black, midlong, midwide; shoulders midwide, usually elevated; beaks wide, 1 mm. long; awns black, 4 to 15 cm. long; kernels red, long, hard, elliptical, acute, curved, inclosed in hull when thrashed; germ small; crease midwide, shallow; cheeks angular; brush small, long.

Black Winter emmer is quite distinct in having pubescent black glumes. Unlike the varieties of spring emmer, this variety is very susceptible to rust. A spike, glumes, a spikelet, and kernels of Black Winter emmer are shown in Plate LVIII, *B*.

History.—Black Winter emmer (*197*, S. P. I. No. 11650) was obtained in 1904 from Vilmorin-Andrieux & Co., Paris, France, by the United States Department of Agriculture. The original importation of 79 pounds of seed was sown in the fall of 1904. From the resulting crop seed was increased and distributed to experiment stations and a number of farmers throughout the United States. The results of experiments since that time have been unfavorable. The variety has not proved sufficiently hardy for growing successfully north of Kansas and Wyoming in the Great Plains area, and has not been able to compete with other cereals in the southern Great Plains.

Distribution.—Grown in experiments in the central and northern Great Plains and commercially to a small extent in Colorado, Kansas, Oklahoma, Texas, Washington, and Wyoming.

Synonym.—Buffum's Improved Winter emmer. This is identical with the emmer described, but is a pure strain and consequently more uniform. Buffum's Improved Winter emmer was distributed by B. C. Buffum, of Worland, Wyo. When director of the Wyoming Agricultural Experiment Station at Laramie he received a small quantity of seed of Black Winter emmer from the Office of Cereal Investigations. After his resignation he selected and improved the crop. From a dozen selected plants of the 1908 crop 34 bushels were produced in 1909, 710 bushels in 1910, and a crop of 20,000 bushels was estimated in 1911. This seed was widely distributed.

SPELT.

Spelt may be of either winter or spring habit and awnless or awned. It has a long, narrow, lax spike and a brittle rachis. The pedicel (joint of the rachis) is long and wide, and after thrashing remains attached to the face of the spikelet below the one which it bears. The spikelets are two-kerneled, arched on the inner side, and closely appressed to the rachis. The kernels, which remain inclosed in the glumes after thrashing, are pale red, long, and laterally compressed, and have an acute tip and a narrow, shallow crease.

Spelt is grown commercially only to a slight extent in America. The varieties often called "Speltz" in this country are not spelt but emmer. A few varieties chiefly grown experimentally are separated in the following key:

KEY TO THE VARIETIES OF SPELT.

		Page.
Spike Awnless.		
Glumes Glabrous.		
Glumes White (*Triticum spelta album* Al.).		
Spring Habit	White Spring	196
Winter Habit	Alstroum	196
Glumes Brown (*T. s. rufum* Al.).		
Winter Habit	Red Winter	197
Spike Awned.		
Glumes Glabrous; White (*T. s. arduinii* Al.).		
Winter Habit	Bearded	197

DESCRIPTIONS, HISTORY, AND DISTRIBUTION OF SPELT VARIETIES.

WHITE SPRING.

Description.—Plant spring habit, late, midtall; stem white, strong; spike awnless, linear-fusiform, lax, erect; glumes glabrous, white, midlong, wide; shoulders wide, square; beaks wide, obtuse, 0.5 mm. long; awns few, 1 to 8 mm. long; kernels red, long, semihard, elliptical, humped, curved, inclosed in glumes; germ small; crease wide, shallow, pitted; cheeks angular; brush midsized, long.

A spike, glumes, a spikelet, and kernels of White Spring spelt are shown in Plate LIX, *A*.

History.—Obtained by the Department of Agriculture from J. M. Thorburn & Co., seedsmen, of New York City, in 1904.

Distribution.—Grown in experiments in North Dakota, but not known to be grown commercially.

ALSTROUM.

Description.—Plant winter habit, late, midtall; stem faintly purple, strong; spike awnless, linear-fusiform, lax, inclined to nodding; glumes glabrous, white, midlong, narrow; shoulders midwide, square; beaks obtuse, 0.5 mm. long; apical awns usually wanting; kernels red, long, semihard, elliptical, humped, curved, inclosed in glumes; germ small; crease wide, shallow; cheeks angular; brush midsized, long.

Alstroum differs from White Spring spelt chiefly in having a winter habit.

History.—Alstroum spelt was obtained by the United States Department of Agriculture in 1901 from the Washington Agricultural Experiment Station, Pullman, Wash. Its further history is undetermined.

Distribution.—Grown in experiments at Arlington Experimental Farm, Va., and by the Washington station, Pullman, Wash. It is known to be commercially grown to a slight extent.

RED WINTER.

Description.—Plant winter habit, late, midtall; stem faintly purple, strong; spike awnless, linear-fusiform, lax, erect; glumes glabrous, brown, midlong to long, wide; shoulders wide, square; beaks obtuse, 0.5 mm. long; apical awns few, 3 to 20 mm. long; kernels red, long, soft, humped, curved, usually inclosed in glumes; germ small; crease wide, shallow; cheeks angular; brush midsized, long.

This variety differs from Alstroum spelt in having brown glumes. A spike, glumes, a spikelet, and kernels of Red Winter spelt are shown in Plate LIX, *B*.

History.—Red Winter spelt was first obtained by the United States Department of Agriculture in 1901 from the Washington Agricultural Experiment Station. Its further history is undetermined. Many samples of this and other spelt varieties doubtless have been introduced into the United States from time to time. A sample of spelt practically identical with the above was introduced from Switzerland about 1913 by Paul Scheddiger, of Spearfish, S. Dak., and was distributed by him in 1915. Most of this winterkilled during the next two winters, which were unusually severe.

Distribution.—Formerly grown to a small extent in South Dakota and Wyoming. Now grown only by experiment stations.

BEARDED.

Description.—Plant winter habit, late, midtall; stem faintly purple, strong; spike awned, linear fusiform, lax, erect; glumes glabrous, yellowish, midlong, midwide; shoulders wide, apiculate; beaks wide, acute, 0.5 mm. long; awns yellowish, 2 to 10 cm. long; kernels red, large, soft, curved, humped, usually inclosed in glumes; germ small; crease wide, shallow, pitted; cheeks angular; brush midsized, long.

History.—Same as Alstroum.

Distribution.—Grown in experiments at Arlington Experimental Farm, Va. Not known to be commercially grown.

POLISH WHEAT.

Polish wheat has a spring habit, tall stems, and a pithy peduncle. The spike is awned, large, and lax. The glumes are papery, an inch or more long, and narrow. The length of the glume equals or exceeds the length of the lemmas. The kernel is long and narrow, sometimes nearly a half inch long, hard, and has a shape somewhat similar to that of a kernel of rye.

Polish wheat usually yields less than other adapted varieties. It also is of inferior value for bread or macaroni manufacture. Under other names it is frequently sold at a high price for seed by unscrupulous seedsmen. Only one variety of Polish wheat is grown in the United States. The characters of this variety are shown in the following key:

KEY TO POLISH WHEAT.

- SPIKE AWNED.
  - GLUMES GLABROUS; WHITE.
    - KERNELS WHITE (*Triticum polonicum levissimum* Haller.).
      - KERNELS LONG TO VERY LONG; HARD.
        - SPRING HABIT ____________________ WHITE POLISH ____ Page. 198

DESCRIPTION, HISTORY, DISTRIBUTION, AND SYNONYMY OF POLISH WHEAT.

WHITE POLISH.

Description.—Plant spring habit, early, tall; stem white, weak; spike awned, linear-oblong, lax, nodding; glumes glabrous, white, paperish, very long, narrow; shoulders usually wanting; beaks narrow, acute, 0.5 to 1 mm. long; awns black, usually deciduous, 4 to 10 cm. long; kernels white (amber) very long, hard, elliptical, acute; germ midsized; crease narrow, shallow to middeep; cheeks usually rounded; brush large, midlong.

A spike, glumes, and kernels of White Polish wheat are shown in Plate LX, *A*.

History.—This wheat is not definitely known to be of Polish origin, as the name implies. It has been grown in England and other European countries for many years, and was early introduced into the United States. It is known to have been grown in Maryland as early as 1845 (*180*, p. 413). From that time until the present frequent references can be found concerning the variety. It has often been used for exploitation by unscrupulous growers or seedsmen, the seed often being sold for as much as $1 a pound. It has been tried in most sections of the United States, but has never become established anywhere for more than a year or two. It is usually a poor yielder, although it has produced large yields in some sections. It is difficult to market this wheat in the United States for purposes other than for feed.

Distribution.—Polish wheat was reported in 1919 only from New Mexico and Wyoming. It is known, however, to be grown sparingly in Idaho, Montana, Nebraska, North Dakota, and South Dakota, and is doubtless grown to a slight extent in many other States.

Synonyms.—Belgian rye, Corn wheat, German rye, Giant rye, Goose wheat, Jerusalem rye, Rice wheat, Siberian Cow, and Wild Goose.

Belgian rye, German rye, Giant rye, and Jerusalem rye are names used by exploiters of Polish wheat because the spikes and kernels have a general resemblance to those of rye.

Corn wheat is the name applied to Polish wheat by W. J. Shields & Co., of Moscow, Idaho, about 1900, the reason stated for so naming it being that it makes the same kind of meal as corn. The exploitation of Polish wheat under this name was continued a number of years, and the wheat is still grown in Idaho under that name.

Goose and Wild Goose are names sometimes applied to Polish wheat, as well as to durum and poulard wheats.

Rice wheat is a name used for Polish wheat by many men in the grain trade. Siberian Cow is the name applied to Polish wheat in Nebraska, according to a report by Walter Fowler, grain supervisor of the United States Department of Agriculture at Omaha, Nebr.

EINKORN.

Einkorn, or 1-grained wheat, has no English name, but is called einkorn in German and that name has become fairly well known in America. The spikes are awned, narrow, slender, and laterally compressed. The spikelets usually contain only one fertile floret, for which reason it is called 1-grained wheat. The terminal spikelets are aborted. The palea splits into two parts at maturity. The kernels, which remain in the spikelets after thrashing, are pale red, slender, and very much compressed. The kernel crease is almost wanting.

Einkorn is not commercially grown in America, and the species itself has no economic importance. The form most commonly grown experimentally is distinguished by the following key:

KEY TO EINKORN.

Spike Awned.
  Glumes Glabrous.
    Glumes White (*Triticum monococcum vulgare* Kcke.). Page.
      Winter Habit______________________________Einkorn__________ 199

DESCRIPTION, HISTORY, AND DISTRIBUTION OF THE VARIETY.

EINKORN.

Description.—Plant winter habit, although usually it will mature seed from spring sowing, late, short; stem white, fine, strong; spike awned, fusiform, middense, erect; glumes glabrous, yellowish, long, narrow; shoulders narrow, apiculate; beaks narrow, acuminate, 1 to 2 mm. long; awns 3 to 10 cm. long; kernels red, midsized, soft, elliptical, acute, humped, compressed, usually inclosed in glumes; germ small; crease narrow, nearly wanting, shallow; cheeks rounded; brush small, short.

This variety of einkorn is described as having a winter habit because the plant remains prostrate during most of the growing season. It usually will produce seed late in the season when sown in the spring and frequently has been grown as spring einkorn. A spike, glumes, a spikelet, and kernels of einkorn are shown in Plate LX, *B*.

History.—Einkorn apparently originated in southern Europe in prehistoric times. Seed of this cereal has been introduced into the United States several times, one of the earliest introductions by the department having been received from Vilmorin-Andrieux & Co., Paris, France, in 1901, but it is known to have been grown in the United States previous to that time. The strain here described was obtained from Erfurt, Germany, in 1904.

Distribution.—Grown by many experiment stations throughout the United States, but not known to be grown commercially.

UNIDENTIFIED VARIETIES.

Among the wheat varieties grown in the United States are a few which have not yet been identified. Nearly 300 names were reported in the varietal survey, of which no material has been obtained and grown. Seed of many of these was requested, but not received. Obviously, some of the names reported were not properly applied to wheat. Others are probably local names used by only a few growers, but not published or generally established. The names of varieties which were reported but not grown or identified by the writers are shown in the following list, together with the State or States from which they were reported:

LIST OF UNIDENTIFIED VARIETIES OF WHEAT, SHOWING THE STATES FROM WHICH THEY WERE REPORTED.

[The history of each variety marked with a star (*) is recorded at the end of the list.]

Name of variety.	State or States where grown.
Amber King	New York.
Amber Red	New York.
America	Kentucky.
American Beauty	Indiana.
American Wonder	Pennsylvania.
Andacy	Alabama.
Anderson	Missouri.
Badger	Indiana.
Baltic	Oklahoma, Tennessee.
Bald	Indiana, Kansas, West Virginia.
Bartlette	Alabama.
Beardsley	Ohio.
Berkhead	Texas.
Big Flint	North Carolina.
Big White	Alabama, Georgia, North Carolina, South Carolina.
Bland	Missouri.
Blocher	Pennsylvania.
*Boughton	Virginia.
Bowden	Alabama, North Carolina, South Carolina, Tennessee, Virginia, West Virginia.
Box	Tennessee.
Broadhead	Oregon.
Brubaker	Michigan, Pennsylvania.
Bull	Illinois.
Bullhead	Kentucky.
Burns	Kentucky.
Camel	Pennsylvania.
*Canada Club	Colorado, Missouri, New York, Idaho.
Canadian Wonder	Pennsylvania.
Cap Chief	Wisconsin.
Carson	Washington.
*Castillione	South Dakota.
Centennial	Indiana.
Chamberlain	Illinois.
Clark's No. 2	New York.
College No. 9	Michigan.
Common Red	Missouri.
Congress	Pennsylvania.
Copper Head	Arkansas, Kentucky, Missouri.
Corkill	Texas.
Cranford Hybrid	New York.
Crooked Finger	Oregon.
Dallas	Georgia.
Delaware Red	Delaware.

List of Unidentified Varieties of Wheat—Continued.

Name of variety.	State or States where grown.
Dibbles	Vermont.
Dietz Prolific	Ohio.
Double Yield	Kentucky.
Duff	Illinois.
Early Champion	Iowa.
Early June	Tennessee.
Early Ohio	Oregon.
Early Red	Kentucky, Tennessee.
Echo	Idaho.
Econimus	Texas.
English	Indiana.
English Prolific	Virginia.
European	Illinois, Michigan, Ohio.
Farmer's Favorite	Indiana.
Fay's Prolific	Indiana.
Fly-Proof	Pennsylvania.
French Bloom	South Carolina.
Fuller	South Carolina.
Fultzo-Clawson	Pennsylvania.
Genesee Golden Chaff	Pennsylvania.
Genesee Red	Indiana, Michigan.
Geneva	California.
Gleason	North Carolina.
Glenn	California.
Gold Dust	Indiana, Ohio, West Virginia.
Golden	North Carolina.
Golden Amber	Illinois.
Goldengrain	Tennessee.
Golden Harvest	Michigan, Pennsylvania.
Golden Plush	Illinois.
Golden Red	North Carolina.
Golden Rock	Indiana.
Golden Rod	Ohio, West Virginia.
Golden Rule	Iowa.
Golden Seal	Missouri.
Good Quality	Ohio.
Goosebill	North Carolina.
Gordon	South Carolina.
Governor	Illinois.
Grant	Nebraska.
Griffith	Kentucky.
Hack	Ohio.
Hancock	Illinois.
Harvesting	Pennsylvania.
Hicks	Indiana.
Homaker	Illinois.
Hundredfold	Tennessee.
Hybrid No. 2	Michigan.
Hybrid No. 4	New York.
Hybrid Prolific	Michigan.
Improved No. 7	Michigan.

LIST OF UNIDENTIFIED VARIETIES OF WHEAT—Continued.

Name of variety.	State or States where grown.
Improved Red	Missouri.
India	Maine, Ohio.
Indian Red	Missouri, Ohio.
Indiana Special	Indiana.
Jersey Red	Tennessee.
Jones' Chaff	Kentucky.
Jones' Prolific	Indiana.
June	Oregon.
Kansas Clubhead	Texas.
Kay's Prolific	Maryland.
Keener	Tennessee.
Kentucky Blue Joint	Michigan.
Kentucky Clayground	Indiana.
Kentucky Hillarde	Ohio.
Kentucky Red	Ohio.
Kentucky White	Kentucky.
Keystone	Ohio.
King	Virginia.
*Kivet	North Carolina.
Keifes	Colorado.
La Crosse	Indiana.
Lamond	Kentucky.
Landflash	Idaho.
Landreth's Longberry	Tennessee.
Late	Georgia.
Late Big Grain	Alabama.
Leader	Pennsylvania.
Little Blood	Indiana.
Little Spring	Tennessee.
Little White	Georgia.
Log Cabin	New York.
Lone Sack	Illinois.
*Lost Nation	Iowa, Maine, Vermont, Wisconsin.
McGee	Missouri, Tennessee.
Mackey	Idaho.
Mammoth Bald	Michigan.
Mammoth Bearded	Alabama.
Manchuria	Ohio.
Manitoba	New York, Tennessee.
Marblehead	Minnesota.
Maryland	Georgia.
May King	Kansas.
Meadow King	North Carolina.
Michigan Gold Standard	Ohio.
Midlenton	Tennessee.
*Minnesota Wonder	Oregon.
Minnesota Chief	Indiana.
Missouri Red	Tennessee.
Monarch	Ohio.
Monitor	Ohio.
Moore	Tennessee, Georgia.

LIST OF UNIDENTIFIED VARIETIES OF WHEAT—Continued.

Name of variety.	State or States where grown.
Morris	North Carolina.
Mortgage	Idaho.
Mountain White	West Virginia.
Muck	Ohio.
Native Spring	New York.
Nelson	Arkansas.
New English	Tennessee.
New Russia	New Mexico.
New York No. 10	Kentucky.
Number 7	New York.
Number 9	Michigan, New York.
Number 12	New York.
Number 16	New York.
Oklahoma Chief	Missouri.
Parker	Kentucky.
Patent Office	Mississippi, Tennessee.
Pearl	Illinois.
Pearl of Harvest	New York.
Pearson's Red	North Carolina.
Peerless	Kentucky, North Carolina, Tennessee.
Pennsylvania Red	Delaware, Kentucky, Maryland, New Jersey, Tennessee.
Phubec	West Virginia.
Premium	Missouri.
Pride of Michigan	Michigan.
Pride of Missouri	New York.
Prize	California, Tennessee.
Purity	West Virginia.
Quacker	Kentucky.
Queen Bess	Michigan.
Rainbow	Alabama.
Red Australian	California.
Red Baldwin	Ohio.
Red Champion	Michigan.
Red Cloud	Missouri.
Red Cure	Oklahoma.
Red Diamond	Pennsylvania.
Red Egyptian	New York.
Red Hackle	Ohio.
Red Imperial	Ohio.
Red Lake	West Virginia.
Red Leader	West Virginia.
Red Monarch	Tennessee, Vermont.
Red No. 2	New York.
Red River	Indiana, Missouri, Ohio, Pennsylvania.
Red River Special	Nebraska, Tennessee.
Red Rust Proof	Mississippi, Tennessee.
Red Tom	Kentucky.
Red Western	Missouri.
Red Willow	Nebraska.
Red Wool	Missouri.

LIST OF UNIDENTIFIED VARIETIES OF WHEAT—Continued.

Name of variety.	State or States where grown.
Reising	Pennsylvania.
Reynolds	Arkansas.
*Rio Grande	Iowa, New York, Wisconsin.
Rock	Illinois, Indiana, Kentucky.
Rodger's Red	Illinois.
Roll	West Virginia.
Royal Cross	Missouri.
Rucker	Georgia.
Russian Empire	Illinois.
Russian Cross	Pennsylvania.
Russian Prolific	Ohio.
Scot	Indiana, Ohio.
Scotland	Iowa.
Scrub	Georgia.
*Sea Island	Illinois, Iowa, Kansas, Missouri, Nebraska.
Shanghai	Maryland.
Sheaf Prolific	South Carolina.
Shepherd's Special	Michigan.
Shoepeg	Tennessee.
Silver Hull	North Carolina.
Silver Queen	Ohio.
Silver Star	Tennessee.
Silver Straw	North Carolina.
Sink	Tennessee.
Smith	Oregon.
Smooth Chaff	North Carolina.
Snowflake	California.
Soft May	Wyoming.
Spangler Beardless	Pennsylvania.
Spring Giant	Washington.
Stevens	South Carolina.
Stewart's No. 13	Pennsylvania.
Stump	Indiana.
Success	Ohio.
Sudling	Missouri.
Superior	Iowa.
Swan	Virginia.
Swings White	North Carolina.
*Tappahanock	Tennessee.
Tennessee Bluestem	Mississippi.
Tennessee Red	Alabama, Indiana, Kentucky, Missouri, North Carolina.
Texas Red	Kentucky, Nebraska, Tennessee.
Thousand Fold	New Jersey.
Turner's High Bred	Maryland.
Victory	Illinois.
Virginia Beauty	North Carolina.
Virginia Bluestem	South Carolina.
Virginia Golden	Oklahoma.
Virginia Red	Virginia.
Wabash	Indiana.

List of Unidentified Varieties of Wheat—Continued.

Name of variety.	State or States where grown.
Wayside Wonder	Delaware.
Webber	West Virginia.
Western Three-Mesh	Oregon.
White Ball	Michigan.
White Bearded	Alabama.
White Boodle	North Carolina.
White Bronze	New York.
White Chaff	Illinois, Kansas, Kentucky, Maryland.
White Chaff Mediterranean	New York.
White Cross	Indiana, Missouri.
White Deal	Michigan.
White Diamond	Ohio.
White Elephant	Michigan.
White Excelsior	North Carolina.
White Flint	Michigan, West Virginia
White Fultz	Kansas, Missouri.
Whitehead	Arkansas.
*White Leader	West Virginia
White Lily	Idaho.
White Lime Stone	Kentucky.
White May	Georgia, Louisiana, Tennessee.
White Mediterranean	West Virginia.
White Mountain	Delaware, New Hampshire.
White Plymouth	Michigan.
White Poole	West Virginia.
White Ray	Arkansas.
White Rock	Michigan, North Carolina, West Virginia.
White Rose	Ohio.
White Valley	Oregon.
White Wave	Indiana.
Whitlock	Tennessee.
Whitney	North Carolina.
Williamsburg	Maryland.
Winter Proof	Illinois.
Winter Queen	Delaware, Ohio, Oklahoma.
Wisconsin Pedigree No. 1	Illinois, Wisconsin.
Wisconsin No. 5	Wisconsin.
World Wonder	Kentucky.
Wright	Michigan.

Of the wheats in the foregoing list, Boughton, Canada Club, Castillione, Kivet, Lost Nation, Minnesota Wonder, Rio Grande, Sea Island, Tappahannock, and White Leader are known to be distinct varieties or mixtures of wheats here described. Nothing is known concerning the other names.

Boughton and Tappahannock are the same variety, both names being commonly used for many years, but the variety has not been identified. The history of the variety is given in the Rural New Yorker of 1858 (*3*), as follows:

> The Lynchburg Virginian says: "Seven years ago (1851) Mr. J. L. Boughton (of Tappahannock, Essex County, Va.) found in his field of wheat four heads that had ripened some 15 days earlier than the remainder of his crop. He preserved the grain and sowed it, and continued resowing it every year, until his crop comes in this year at least a month earlier than usual."

Canada Club is a spring wheat and was widely grown from 1850 to 1870. It since has practically disappeared from cultivation in the United States. It is stated by Danielson (*76*, p. 385) to be the Golden Drop originated by F. F. Hallett, of Brighton, England. De Neven (*78*, p. 148) reported its use and history in 1854 to be as follows:

> The "Canada Club" variety, which is generally regarded among our farmers as the most profitable spring wheat, considering the ease of raising it, brings, together with the "Rio Grande," the highest market price. It was brought to the United States from Canada, where it formerly was extensively cultivated; but not so much now on account of the terrible ravages of the weevil. It was introduced into Canada from France, where it is, at this day, the kind most raised. This wheat is vulgarly known in that country by the name of "Petit blé de mars blanc" (small March white wheat), all kinds of spring wheat being generally designated as "blé de mars," as March is the month in which it is usually sown.
>
> The "Canada Club" is a bald wheat, grows remarkably even and straight. The straw is uncommonly stiff and its height rather below medium, for which reasons it is less liable to be laid low by the winds and storms than any kind of spring wheat with which I am acquainted, a quality of great value to farmers. The flour made from it is not very fine, but good; and the quality heavy.

Castillione is a badly mixed durum spring wheat distributed by Lorenzo Falzone, of Milesville, S. Dak., in 1917. He obtained 2 pounds of seed in Italy and grew it for the first time in South Dakota in 1914, increasing it in 1915 and 1916. As it proved more resistant to stem rust in 1916 than other varieties in his neighborhood, he distributed it as a rust-resistant variety. Experiments have not shown it to be especially resistant, however. The fact that it contains three distinct types makes it objectionable for growing and impossible to classify here. It contains strains having both white and black awns and glabrous and pubescent glumes, which may be either white or yellowish. The kernels of all strains are white (amber).

Kivet is a white-kerneled wheat which has been grown in North Carolina for many years. It was obtained by Blount (*47*) and grown and reported in 1892 in his New Mexico experiments. It possibly is the same wheat as White Wonder, as both are grown in the same localities.

Lost Nation is an old awnless spring wheat of the northeastern United States, which has now gone out of cultivation. A history of the wheat was recorded in 1878 in the Rural New Yorker as follows:

With regard to this variety of wheat, Doctor Hoskins of Orleans County, Vt., writes us: "I was one of the very first to plant it in Vermont, having, with three others in different parts of the State, four years ago received a quart of it from Rev. Marcus A. Keep, of Dalton, Aroostook County, Me. I got a bushel from the quart, sowed it all and distributed the 26 bushels that grew from it among my neighbors, and now it is the principal wheat in the vicinity."

Minnesota Wonder and Early Wonder are names used for a mixture of Kinney, Huston, and Defiance, grown in the Willamette Valley of Oregon.

Rio Grande is a bearded spring wheat which was reported grown in Wisconsin as early as 1853. Concerning it De Neven (*78*, p. 148) has recorded the following information:

> "The Rio Grande" wheat was introduced among us more recently than the "Canada Club." * * * It was brought into Illinois by an Englishman, a soldier in the Mexican War, who carried from the banks of the Rio Grande a handful in his knapsack and sowed it in his garden, from which my seed was derived. * * * It grows very tall, having the ears furnished with long beards and, altogether, when standing in the field, it strongly resembles the "Black Sea" variety, only the straw is somewhat larger, if not longer.

In 1896 Hays (*108*, p. 322) discussed its probable value for Minnesota, as follows:

> University No. 72, Rio Grande, has been grown by the experiment station for a number of years. It is a medium-sized plant, bearded, chaff is smooth, white, and holds tightly to the berry. The berry has much the same appearance as the Red Fife, but has usually graded one grade below Fife grown beside it. As it is bearded, hardly as good a yielder as Fife and Bluestem, and not able to secure as good grades, this variety will hardly compete with the standard sorts. This wheat at times has seemed especially susceptible to the effects of rust.

Sea Island is a spring wheat which was quite commonly grown in Nebraska during the nineties, but which has now nearly gone out of cultivation. The origin of the variety is undetermined. A sample was obtained from Colorado in 1919, but it was badly mixed, containing at least five distinct types, so its correct identity could not be determined.

White Leader or Early White Leader is a variety listed on the stationery of A. N. Jones, of Newark, Wayne County, N. Y., where he claims to have originated it in 1893. Nothing further is known concerning it.

ESTIMATED ACREAGE OF VARIETIES.

The varietal survey, previously mentioned, has furnished a basis for estimating the actual and percentage acreages of the different varieties (Tables 2 and 3). In compiling Table 2 all estimated percentage acreages from all reports from a county were totaled and the average percentage which each variety represented in the wheat acreage of the county was determined. The actual number of acres of wheat in each county, as determined by the preliminary reports of the Fourteenth United States Census, were used to compute the estimated number of acres of each variety. The varietal survey and the census data were for the same year, 1919. The estimated acreage of the different varieties in each State (Table 2) and in the United States (Table 3) thus have been determined and a corresponding weighted percentage computed.

In filling out the varietal questionnaires many reporters listed only the most important varieties and grouped the remaining as "others" or else failed to report varieties totaling a full 100 per cent. Other correspondents reported "no wheat" where the census reports showed a small acreage for the county. These undetermined percentages have been carried as "others and not reported" in all computations. The unidentified varieties reported have also been included under that heading.

Most of the crop reporters were not acquainted with the names of varieties of club and durum wheat. Instead of reporting varieties, therefore, these classes of wheat usually were reported merely as "club" and "durum." In tabulating the results these class names are used with the explanation "varieties not reported" in parentheses. The acreage data for club and durum varieties, therefore, are of little value, but the varieties known by the writers to be grown are listed by name in all cases. Where these names were not reported on the survey, the acreage and percentage columns are left blank. For all varieties reported but which have an estimated actual acreage of less than 100 acres or an estimated percentage of less than 0.1 per cent, leaders (dotted lines) are shown in each figure column. The figures following the State names show the number of reports used in computing the averages.

TABLE 2.—*Estimate of actual and percentage acreages of wheat varieties grown in the several States in 1919.*

[Figures in parentheses following the names of States show the number of reports used in computing the averages.]

State and variety.	Area grown.	
	Acres.	Per cent.
ALABAMA (223).		
Currell	......	......
Flint	200	0.6
Fulcaster	5,700	16.8
Fultz	600	1.8
Leap	......	......
Mealy	200	.6
Mediterranean	......	......
Poole	......	......
Purplestraw	18,500	54.4
Red May	3,000	8.8
ALABAMA—continued.		
Turkey	......	......
Others and not reported	5,817	17.0
Total	34.017	100.0
ARIZONA (41).		
Alaska	200	.5
Baart	20,100	55.6
Club (varieties not reported)	6,300	17.4

TABLE 2.—*Estimate of actual and percentage acreages of wheat varieties grown in the several States in 1919*—Continued.

State and variety.	Area grown.	
	Acres.	Per cent.
ARIZONA—continued.		
Defiance	400	1.1
Durum (varieties not reported)	200	.5
Indian	200	.5
Little Club	500	1.4
Martin	200	.5
Marquis	300	.8
Pacific Bluestem	600	1.7
Sonora	5,700	15.8
Touse	100	.3
Turkey	600	1.7
Others and not reported	942	2.2
Total	36,342	100.0
ARKANSAS (274).		
Currell	2,800	1.1
Flint	3,700	1.4
Fulcaster	30,400	11.9
Fultz	37,100	14.5
Gold Drop	600	.2
Gipsy	3,000	1.2
Harvest Queen	100	......
Marquis	200	.1
Mediterranean	24,100	9.4
Nigger	1,400	.5
Poole	1,200	.5
Purplestraw	21,500	8.4
Red May	63,700	24.9
Red Wave	3,300	1.3
Rice	500	.2
Rudy	1,300	.5
Turkey	14,300	5.6
Walker	4,100	1.6
Others and not reported	42,908	16.7
Total	256,208	100.0
CALIFORNIA (205).		
Alaska		
Baart	116,400	10.7
Big Club	500	......
Bobs	......	......
Bunyip	......	......
Canadian Red	300	......
Chul	1,900	.2
Club (varieties not reported)	111,900	10.3
Dart	......	......
Defiance	26,500	2.4
Durum (varieties not reported)	600	.1
Early Defiance	......	......
Fretes	1,700	.2
Galgalos	18,000	1.7
Goldcoin	......	......
Hard Federation		
Jumbuck		
Little Club	27,100	2.5
Lynn	9,300	.9
Marquis	4,700	.4
Odessa	2,900	.3
Pacific Bluestem	441,400	40.5
Pilcraw	......	......
Propo	19,400	1.8
Quality		
Sol	......	......
Sonora	190,600	17.5
Surprise	29,300	2.7
Turkey	7,200	.7
White Federation		
White Winter	2,000	.2
Others and not reported	79,614	6.9
Total	1,091,314	100.0
COLORADO (253).		
Alton		
Arnautka		
Baart	100	......
Black Winter (emmer)		
Club (varieties not reported)	2,900	0.2
Colorado No. 50	700	......
Defiance	124,000	9.3
Durum (varieties not reported)	148,000	11.2
Haynes Bluestem	3,100	.2
Jones Fife	4,600	.3
Kubanka	100	......
Ladoga	6,100	.5
Marquis	125,200	9.4
Pacific Bluestem	7,900	.7
Palisade	1,600	.1
Preston	......	......
Regenerated Defiance	......	......
Sonora	3,300	.2
Surprise	1,500	.1
Turkey	884,300	66.6
Vernal (emmer)	......	......
Others and not reported	15,613	1.2
Total	1,329,013	100.0
CONNECTICUT (18).		
Durum (varieties not reported)	......	......
Goldcoin	100	3.6
Leap	......	......
Marquis	1,000	36.0
Purplestraw	300	10.8
Red May	100	3.6
Red Rock	......	......
Red Wave	400	14.4
Others and not reported	876	31.6
Total	2,776	100.0
DELAWARE (27).		
Currell	1,100	.9
Fulcaster	18,800	14.9
Fultz	14,100	11.2
Fultzo-Mediterranean	400	.3
Gipsy	1,700	1.4
Leap	12,700	10.1
Mediterranean	7,700	6.1
Poole	1,300	1.3
Red Wave	800	.6
Rudy	800	.6
Others and not reported	66,340	52.6
Total	125,740	100.0
FLORIDA (8).		
Fulcaster	......	......
Fultz	......	......
Mediterranean	......	......
Purplestraw	10	38.0
Others and not reported	16	62.0
Total	26	100.0
GEORGIA (864).		
Climax	......	......
Currell	1,000	.7
Diehl-Mediterranean	100	.1
Flint	......	......
Fulcaster	17,700	12.4
Fultz	2,100	1.4
Grandprize	......	......
Leap	2,300	1.6

Table 2.—*Estimate of actual and percentage acreages of wheat varieties grown in the several States in 1919*—Continued.

State and variety.	Area grown.	
	Acres.	Per cent.
GEORGIA—continued.		
Mealy	700	0.5
Mediterranean	600	.4
Poole	......	......
Purplestraw	77,400	54.2
Red May	34,100	23.9
Red Wave	......	......
Rice	100	.1
Others and not reported	6,789	4.7
Total	142,889	100.0
IDAHO (251).		
Alaska	......	......
Allen	1,800	.2
Baart	15,200	1.3
Big Club	12,300	1.1
Club (varieties not reported)	44,700	3.9
Defiance	15,400	1.3
Dicklow	159,800	14.0
Durum (varieties not reported)	1,900	.2
Eaton	4,300	.4
Fultz	400	......
Goldcoin	92,800	8.1
Gypsum	9,600	.8
Hybrid 128	1,800	.2
Jenkin	21,300	1.9
Jones Fife	25,200	2.2
Little Club	24,600	2.2
Lofthouse	3,600	.3
Marquis	185,400	16.2
Martin	7,400	.6
Mediterranean	200	......
Odessa	14,500	1.3
Pacific Bluestem	141,600	12.4
Redchaff	4,400	.4
Red Clawson	......	......
Red Fife	2,300	.2
Red Russian	38,600	3.4
Regenerated Defiance		
Sonora	22,800	2.0
Surprise	5,300	.5
Touse	2,600	.2
Turkey	178,000	15.6
White Polish		
Others and not reported	103,495	9.1
Total	1,141,295	100.0
ILLINOIS (837).		
China	2,400	.1
Climax	7,400	.2
Currell	22,400	.5
Dawson	4,900	.1
Democrat	1,700	......
Diehl-Mediterranean	6,200	.1
Durum (varieties not reported)	10,500	.3
Flint	6,100	.1
Fulcaster	105,200	2.5
Fultz	991,600	24.1
Fultzo-Mediterranean	50,000	1.2
Gipsy	4,000	.1
Goens	3,800	.1
Goldcoin	2,000	......
Grandprize	6,400	.1
Harvest Queen	94,900	2.3
Haynes Bluestem	32,600	.8
Humpback	4,100	.1
Illini Chief	......	......
Iowa No. 404	900	......
Java	2,600	.1
Jones Fife	126,400	3.1
Leap	200	......
Martin	......	......
ILLINOIS—continued.		
Marquis	464,800	11.3
Mediterranean	261,500	6.4
Nigger	29,700	.7
Odessa	900	......
Poole	112,900	2.8
Preston	23,800	.6
Red Clawson	2,500	.1
Red Fife	3,400	.1
Red May	138,200	3.4
Red Rock	2,500	.1
Red Wave	142,400	3.5
Rudy	15,300	.4
Russian Red	23,900	.6
Turkey	1,106,200	27.0
Valley	4,800	.1
Walker	3,900	.1
Others and not reported	281,950	6.9
Total	4,104,950	100.0
INDIANA (902).		
China	2,000	0.1
Climax	1,300	......
Currell	28,200	1.0
Dawson	100	......
Diehl-Mediterranean	1,400	......
Durum (varieties not reported)	2,400	.1
Fulcaster	35,000	1.2
Fultz	410,700	14.7
Fultzo-Mediterranean	29,000	1.0
Gipsy	17,500	.6
Goens	60,800	2.1
Goldcoin	2,200	.1
Grandprize	4,500	.2
Harvest Queen	4,700	.2
Jones Fife	25,200	.9
Leap	2,900	.1
Mammoth Red	700	......
Marquis	11,000	.4
Mealy	......	......
Mediterranean	63,900	2.3
Nigger	100,600	3.6
Odessa	1,500	.1
Poole	707,600	25.3
Prosperity	1,800	.1
Red Clawson	7,500	.3
Red May	147,200	5.3
Red Rock	15,200	.5
Red Wave	369,700	13.2
Rudy	238,100	8.5
Russian Red	58,500	2.1
Turkey	128,100	4.6
Valley	200	......
Wheedling	10,900	.4
Others and not reported	308,257	11.0
Total	2,798,657	100.0
IOWA (737).		
Durum (varieties not reported)	15,400	1.1
Fultz	5,300	.4
Fultzo-Mediterranean	900	.1
Harvest Queen	400	......
Haynes Bluestem	96,000	4.8
Iowa No. 404	13,100	.9
Iowa No. 1946		
Java	4,800	2.8
Jones Fife	200	......
Marquis	402,800	28.0
Mediterranean	2,200	.2
Odessa	500	......
Preston	65,100	4.5
Red Fife	14,000	1.0

TABLE 2.—*Estimate of actual and percentage acreages of wheat varieties grown in the several States in 1919*—Continued.

State and variety.	Area grown.	
	Acres.	Per cent.
IOWA—continued.		
Red May	14,000	1.0
Red Wave	600	......
Turkey	749,100	52.0
Others and not reported	53,396	3.2
Total	1,437,796	100.0
KANSAS (1360).		
Alton	8,100	0.1
Blackhull	......	......
Black Winter (emmer)		
Currell	130,200	1.2
Diehl-Mediterranean	62,500	.6
Durum (varieties not reported)	43,200	.4
Fulcaster	111,700	1.0
Fultz	334,300	3.0
Fultzo-Mediterranean	900	......
Gipsy	2,200	......
Harvest Queen	509,100	4.5
Illini Chief	9,600	.1
Kanred	87,200	.8
Ladoga	......	......
Marquis	3,200	......
Mediterranean	78,300	.7
Nigger	9,400	.1
Odessa	3,300	......
Palisade	25,900	.2
Penquite	12,000	.1
Poole	14,200	.1
Red Clawson	300	......
Red May	141,100	1.3
Red Wave	6,700	.1
Rupert	1,600	......
Turkey	9,279,700	82.2
Valley	......	......
Vernal (emmer)		
Zimmerman	3,000	......
Others and not reported	407,166	3.5
Total	11,279,866	100.0
KENTUCKY (515).		
Ashland		
China	1,800	.2
Climax	1,000	.1
Currell	69,200	8.3
Dawson	900	.1
Diehl-Mediterranean	300	......
Durum (varieties not reported)	1,000	.1
Fulcaster	97,900	11.8
Fultz	279,200	33.6
Fultzo-Mediterranean	25,700	3.1
Gipsy	100	......
Goldcoin	1,500	.2
Golden Cross	500	.1
Grandprize	4,100	.5
Jones Fife	7,800	.9
Leap	1,700	.2
Longberry No. 1	3,900	.5
Martin	3,300	.4
Mediterranean	49,900	6.0
Mealy	4,000	.5
Nigger	500	......
Odessa	9,400	1.1
Poole	100,500	12.1
Purplestraw	400	......
Red Clawson	400	......
Red May	16,100	1.9
Red Wave	34,900	4.2
Rice	7,000	.8
Rudy	5,700	.7
Rupert	100	......
Russian Red	10,700	1.3
KENTUCKY—continued.		
Turkey	1,200	0.1
Walker	3,500	.4
Others and not reported	86,532	10.8
Total	830,732	100.0
LOUISIANA (12).		
Fultz	......	......
Fultzo-Mediterranean	200	11.7
Marquis	......	......
Purplestraw	200	11.7
Red May	......	......
Others and not reported	1,314	76.6
Total	1,714	100.0
MAINE (48).		
Durum (varieties not reported)	......	......
Marquis	10,300	71.2
Red Fife	2,000	13.8
Wellman	......	......
Others and not reported	2,164	15.0
Total	14,464	100.0
MARYLAND (137).		
China	12,500	1.9
Currell	88,300	13.3
Diehl-Mediterranean	2,000	.3
Durum (varieties not reported)	......	......
Fulcaster	178,200	26.8
Fultz	117,400	17.7
Fultzo-Mediterranean	19,100	2.9
Leap	43,700	6.6
Mammoth Red	1,400	.2
Marquis	200	......
Mediterranean	39,800	6.0
Poole	11,900	1.8
Purplestraw	13,600	2.0
Red Clawson	600	.1
Red Wave	9,400	1.4
Rudy	13,100	2.0
Silversheaf	20,400	3.1
Others and not reported	92,695	13.9
Total	664,295	100.0
MASSACHUSETTS (16).		
Dawson	300	16.0
Marquis	1,000	53.3
Red Fife	100	5.3
Others and not reported	476	25.4
Total	1,876	100.0
MICHIGAN (571).		
Dawson	54,400	6.1
Diehl-Mediterranean	11,500	1.3
Durum (varieties not reported)	5,700	.6
Fulcaster	4,900	.6
Fultz	5,200	.6
Fultzo-Mediterranean	3,700	.4
Gipsy	3,700	.4
Goens	3,300	.4
Goldcoin	133,500	15.1
Golden Cross	400	.1
Grandprize	......	......
Harvest Queen	1,100	.1
Haynes Bluestem	7,000	.8
Jones Fife	2,600	.3

TABLE 2.—*Estimate of actual and percentage acreages of wheat varieties grown in the several States in 1919*—Continued.

State and variety.	Area grown.	
	Acres.	Per cent.
MICHIGAN—continued.		
Kanred	2,800	0.3
Longberry No. 1	......	......
Mammoth Red	400	......
Marquis	59,300	6.7
Martin	2,200	.2
Mediterranean	8,500	1.0
Nigger	27,500	3.1
Poole	22,200	2.5
Preston	10,600	1.2
Prosperity	2,000	.2
Red Clawson	34,300	3.9
Red Fife	7,600	.9
Red May	9,800	1.1
Red Rock	195,400	22.1
Red Wave	58,700	6.6
Rudy	18,500	2.1
Rupert	100	......
Russian Red	3,100	.4
Treadwell	1,000	.1
Turkey	7,400	.8
Windsor	100	......
Others and not reported	176,960	20.0
Total	885,460	100.0
MINNESOTA (1,008).		
Arnautka		
Dixon		
Durum (varieties not reported)	137,300	3.6
Glyndon		
Haynes Bluestem	361,800	9.5
Humpback	18,400	.5
Kubanka		
Marquis	2,175,300	57.4
Mindum		
Minhardi		
Minturki		
Pental	300	......
Preston	800,700	21.1
Red Fife	65,900	1.8
Red May	600	......
Turkey	62,200	1.6
Vernal (emmer)		
White Fife	2,400	......
Others and not reported	168,502	4.5
Total	3,793,402	100.0
MISSISSIPPI (132).		
Fulcaster	300	3.3
Fultz	......	......
Mediterranean	......	......
Purplestraw	2,200	24.2
Red May	2,700	29.7
Turkey	......	......
Others and not reported	3,883	42.8
Total	9,083	100.0
MISSOURI (1,009).		
Climax	1,100	......
Currell	155,300	3.4
Dawson	500	......
Flint	3,800	.1
Fulcaster	273,800	6.0
Fultz	1,608,900	37.0
Fultzo-Mediterranean	92,300	2.0
Gipsy	3,300	.1
Gold Drop	900	......
Harvest Queen	176,400	3.9
Illini Chief	11,200	.2
Jones Fife	29,100	.6
MISSOURI—continued.		
Leap	1,500	......
Mammoth Red	2,200	......
Martin	1,700	......
Marquis	12,800	0.3
Mealy	2,100	......
Mediterrranean	341,600	7.5
Nigger	6,100	.1
Odessa	7,600	.2
Poole	172,000	3.8
Prosperity	17,100	.4
Red Clawson	7,100	.2
Red Fife	300	......
Red May	443,200	9.7
Russian Red	11,900	.3
Red Wave	78,000	1.7
Rudy	1,800	......
Turkey	593,000	13.0
Walker	4,900	.1
Zimmerman	9,600	.2
Others and not reported	493,358	9.2
Total	4,564,458	100.0
MONTANA (246).		
Alaska	......	......
Arnautka	......	......
Baart	......	......
Big Club	1,500	0.1
Champlain	3,100	.2
Club (varieties not reported)	10,600	.6
Dicklow	600	......
Durum (varieties not reported)	269,300	15.7
Fleming	......	......
Goldcoin	100	......
Haynes Bluestem	104,100	6.1
Jones Fife	19,300	1.1
Kahla	4,000	.2
Kubanka	2,100	.1
Ladoga	900	......
Little Club	200	......
Marquis	689,800	40.3
Montana No. 36	100	......
Pacific Bluestem	11,100	.6
Peliss	1,400	.1
Pentad	4,200	.2
Preston	22,800	1.3
Quality	......	......
Red Fife	55,400	3.2
Red Russian	200	......
Regenerated Defiance	......	......
Sonora	......	......
Stanley	......	......
Touse	100	......
Turkey	369,900	21.6
Velvet Don	600	......
Vernal (emmer)	......	......
White Polish	......	......
Others and not reported	138,402	8.6
Total	1,709,802	100.0
NEBRASKA (971).		
Big Frame	......	......
Club (varieties not reported)	600	......
Converse	4,300	.1
Defiance	200	......
Dixon		
Durum (varieties not reported)	205,400	4.9
Fulcaster	800	......
Harvest Queen	1,400	......
Haynes Bluestem	28,700	.7
Humpback	300	......
Java	10,900	.3

TABLE 2.—*Estimate of actual and percentage acreages of wheat varieties grown in the several States in 1919*—Continued.

State and variety.	Area grown.	
	Acres.	Per cent.
NEBRASKA—continued.		
Ladoga	10,400	0.2
Marquis	179,300	4.2
Mediterranean	1,700	......
Nebraska No. 28		
Nebraska No. 60		
Odessa	1,200	......
Palisade	14,000	.3
Pentad	700	......
Preston	121,000	2.9
Red Fife	9,000	.2
Red May	2,000	......
Regenerated Defiance		
Turkey	3,499,000	82.8
Velvet Don		
Vernal (emmer)		
White Fife	......	......
White Polish		
Others and not reported	138,882	3.4
Total	4,229,782	100.0
NEVADA (23).		
Baart	200	.9
Chul	......	......
Club (varieties not reported)	3,800	17.3
Defiance	200	.9
Goldcoin	600	2.7
Little Club	600	2.7
Pacific Bluestem	6,700	30.5
Marquis	3,000	13.6
Red Fife	200	.9
Sonora	800	3.6
Touse	1,300	5.9
Turkey	1,600	7.3
Others and not reported	2,987	13.7
Total	21,987	100.0
NEW HAMPSHIRE (26).		
Marquis	1,200	87.8
Red Fife	......	......
Others and not reported	166	12.2
Total	1,366	100.0
NEW JERSEY (35).		
China	200	0.2
Diehl-Mediterranean	......	......
Fulcaster	16,800	19.8
Fultz	3,000	3.5
Gipsy	200	.2
Goldcoin	100	.1
Leap	5,300	6.2
Marquis	300	.4
Mediterranean	26,900	31.7
Red Clawson	700	.8
Red Wave	5,600	6.6
Rochester	400	.5
Russian Red	100	.1
Others and not reported	25,293	29.9
Total	84,893	100.0
NEW MEXICO (82).		
Alaska	400	0.3
Baart	2,800	2.1
Clackamas		
Club (varieties not reported)	400	.3
Defiance	3,400	2.5
Durum (varieties not reported)	9,600	7.1
Marquis	8,100	6.0
NEW MEXICO—continued.		
Pacific Bluestem	200	0.1
Regenerated Defiance		
Turkey	83,100	61.5
Sonora	19,800	14.6
White Polish	200	.1
Others and not reported	7,185	5.4
Total	135,185	100.0
NEW YORK (300).		
Dawson	53,200	11.5
Democrat	2,300	.5
Diehl-Mediterranean	500	.1
Durum (varieties not reported)	700	.2
Forward		
Fulcaster	7,200	1.6
Fultz	7,000	1.6
Goldcoin	222,000	47.9
Grandprize	800	.2
Honor		
Java	700	.2
Leap	300	.1
Longberry No. 1	700	.2
Martin	300	.1
Marquis	52,500	11.3
Mediterranean	5,700	1.2
Poole	2,200	.5
Portage	400	.1
Pride of Genesee	2,400	.5
Prosperity	7,800	1.7
Red Clawson	4,500	1.0
Red Fife	6,900	1.5
Red Wave	14,600	3.2
Rochester	500	.1
Rudy	4,400	.1
Russian Red	800	.2
Silversheaf	400	.1
Turkey	800	.2
White Wonder	500	.1
Others and not reported	63,794	14.0
Total	463,894	100.0
NORTH CAROLINA (559).		
Climax	......	......
Currell	22,000	3.6
Diehl-Mediterranean	300	......
Flint	32,800	5.3
Fulcaster	199,900	32.2
Fultz	18,400	3.0
Fultzo-Mediterranean	7,500	1.2
Goldcoin	200	......
Greeson	5,100	.8
Homer	......	......
Leap	153,100	24.7
Martin	100	......
Marquis	......	......
Mealy	600	.1
Mediterranean	5,200	.8
Oakley	1,500	.2
Poole	300	......
Purplestraw	86,500	13.9
Red Clawson	100	......
Red May	15,400	2.5
Red Wave	1,800	.3
Rice	7,300	1.2
Rudy	300	......
Russian Red	2,400	.4
Silversheaf	800	.1
Others and not reported	59,059	9.7
Total	620,659	100.0

TABLE 2.—*Estimate of actual and percentage acreages of wheat varieties grown in the several States in 1919*—Continued.

State and variety.	Area grown.	
	Acres.	Per cent.
NORTH DAKOTA (757).		
Acme	......	......
Alaska		
Arnautka		
Buford		
Durum (varieties not reported)	2,611,500	28.7
Chirka		
Glyndon	2,000	......
Haynes Bluestem	725,100	8.0
Humpback	6,600	.1
Kahla	14,700	.2
Kota		
Kubanka	26,900	.3
Kubanka No. 8		
Marquis	4,274,800	47.0
Monad		
Pelíss		
Pentad	33,500	.4
Power	9,100	.1
Preston	760,100	8.4
Red Fife	526,000	5.8
Turkey	33,900	.4
Vernal (emmer)		
White Fife		
White Polish		
Others and not reported	74,273	.6
Total	9,098,473	100.0
OHIO (813).		
Currell	4,700	.2
Dawson	5,200	.2
Democrat	1,500	.1
Diehl-Mediterranean	1,600	.1
Durum (varieties not reported)	400	......
Flint	1,000	......
Fulcaster	24,000	.8
Fultz	300,100	10.3
Fultzo-Mediterranean	12,800	.4
Gipsy	84,000	2.9
Gladden	7,700	.3
Goens	64,200	2.2
Goldcoin	74,700	2.6
Golden Cross	400	......
Grandprize	5,800	.2
Harvest Queen	600	......
Illini Chief	500	......
Jones Fife	9,900	.3
Leap	800	......
Martin	1,200	......
Marquis	24,900	.9
Mealy	23,300	.8
Mediterranean	55,500	1.9
Nigger	103,200	3.5
Penquite	......	......
Poole	1,133,900	39.2
Portage	4,100	.1
Prosperity	11,400	.4
Read	......	......
Red Clawson	16,500	.6
Red May	15,300	.5
Red Rock	2,900	.1
Red Wave	249,200	8.6
Rudy	46,200	1.6
Rupert	10,300	.4
Russian Red	34,300	1.2
Turkey	6,100	.2
Trumbull	1,900	.1
Valley	400	......
Wyandotte	700	......
Others and not reported	554,792	19.3
Total	2,922,592	100.0

State and variety.	Area grown.	
	Acres.	Per cent.
OKLAHOMA (429).		
Black Winter (emmer)		
Club (varieties not reported)	5,800	0.1
Currell	70,400	1.5
Diehl-Mediterranean	2,400	.1
Durum (varieties not reported)	9,000	.2
Fulcaster	322,400	6.8
Fultz	155,900	3.3
Fultzo-Mediterranean	9,600	.2
Harvest Queen	218,200	4.6
Kanred	10,300	.2
Mediterranean	215,800	4.6
Poole	700	......
Purplestraw	6,200	.1
Quality		
Red Fife	......	......
Red May	39,800	.8
Red Wave	900	......
Rudy	8,500	.2
Sibley	200	......
Turkey	3,235,500	68.6
Vernal (emmer)		
Walker	1,800	......
Others and not reported	404,505	8.7
Total	4,717,905	100.0
OREGON (161).		
Alaska	......	......
Ariette		
Baart	39,700	3.7
Big Club	3,600	.3
Bluechaff	......	......
Clackamas		
Club (varieties not reported)	58,200	5.4
Cox	1,000	.1
Dale	2,200	.2
Defiance	18,500	1.7
Durum (varieties not reported)	1,000	.1
Eaton	5,200	.5
Foisy	41,300	3.8
Federation		
Galgalos	16,500	1.5
Goldcoin	155,500	14.4
Hard Federation		
Huston	22,400	2.1
Hybrid 63	17,600	1.6
Hybrid 123	1,200	.1
Hybrid 128	103,300	9.6
Jenkin	4,500	.4
Kahla	......	......
Kinney	23,400	2.2
Little Club	32,100	3.0
Martin	5,000	.5
Marquis	23,700	2.2
Pacific Bluestem	121,700	11.3
Prohibition	24,600	2.3
Redchaff	22,000	2.0
Red Fife	2,400	.2
Red Russian	7,700	.8
Rink	14,400	1.3
Sonora	12,600	1.2
Squarehead	......	......
Surprise	1,000	.1
Triplet		
Turkey	142,400	13.2
White Winter	50,700	4.7
Wilbur	6,700	.6
Others and not reported	97,947	8.9
Total	1,080,047	100.0

TABLE 2.—*Estimate of actual and percentage acreages of wheat varieties grown in the several States in 1919*—Continued.

State and variety.	Area grown.	
	Acres.	Per cent.
PENNSYLVANIA (454).		
Alaska	......	......
China	42,400	3.0
Climax	6,000	.4
Currell	2,700	.2
Dawson	2,100	.1
Democrat	600	......
Diehl-Mediterranean	20,200	1.4
Durum (varieties not reported)	500	......
Fulcaster	335,200	23.4
Fultz	236,500	16.6
Fultzo-Mediterranean	22,200	1.6
Gipsy	1,000	.1
Goens	500	......
Goldcoin	13,700	1.0
Gold Drop	400	......
Grandprize	14,500	1.1
Harvest Queen	200	......
Jones Fife	6,100	.4
Leap	25,800	1.8
Martin	1,100	.1
Marquis	2,600	.2
Mealy	17,900	1.2
Mediterranean	132,600	9.3
Nigger	2,100	.1
Penquite	200	......
Poole	91,000	6.4
Portage	......	......
Prosperity	4,500	.3
Purplestraw	......	......
Red Clawson	3,600	.3
Red Fife	2,400	.2
Red May	6,100	.4
Red Wave	107,700	7.5
Rudy	52,200	3.7
Russian Red	7,200	.5
Schonacher	1,000	.1
Silversheaf	2,900	.2
Turkey	1,900	.1
Others and not reported	261,937	18.3
Total	1,429,537	100.0
RHODE ISLAND (2).		
Fulcaster	......	......
Marquis	......	......
Mediterranean	......	......
Others and not reported	106	100.0
Total	106	100.0
SOUTH CAROLINA (295).		
Currell	900	1.4
Flint	7,300	8.5
Fulcaster	3,100	3.6
Fultz	1,500	1.7
Leap	13,200	15.3
Mealy	......	......
Poole	300	.3
Purplestraw	32,800	38.0
Red May	17,900	20.7
Silversheaf	......	......
Others and not reported	9,124	10.5
Total	86,124	100.0
SOUTH DAKOTA (755).		
Acme		
Arnautka		
Durum (varieties not reported)	654,500	16.8
Ghirka	600	......
Glyndon		
Haynes Bluestem	153,900	4.0
Humpback	900	......
SOUTH DAKOTA—continued.		
Kahla	800	......
Khapli (emmer)		
Kubanka	22,800	0.6
Marquis	2,385,600	61.1
Pentad	10,600	.3
Preston	401,000	10.3
Red Fife	35,900	.9
Regenerated Defiance		
Turkey	56,800	1.5
Vernal (emmer)		
White Polish		
Others and not reported	171,711	4.5
Total	33,895,111	100.0
TENNESSEE (526).		
Currell	29,600	4.3
Dawson	1,400	.2
Diehl-Mediterranean	4,600	.7
Durum (varieties not reported)	100	......
Flint	400	.1
Fulcaster	277,900	40.5
Fultz	95,800	14.0
Fultzo-Mediterranean	11,100	1.6
Gold Drop	800	.1
Harvest Queen	400	.1
Leap	23,700	3.5
Martin	1,600	.2
Marquis	......	......
Mealy	16,600	2.4
Mediterranean	23,600	3.4
Odessa	3,700	.5
Poole	37,200	5.4
Purplestraw	6,900	1.0
Red May	41,900	6.1
Red Wave	1,100	.2
Rice	14,800	2.2
Rupert	2,200	.3
RussianRed	2,700	.4
Turkey	500	.1
Walker	4,500	.7
Others and not reported	82,397	12.0
Total	685,497	100.0
TEXAS (692).		
Arnautka	14,400	.6
Baart	400	......
Black Winter (emmer)		
Durum (varieties not reported)	26,000	1.1
Fulcaster	43,400	1.8
Fultz	22,200	.9
Kubanka	400	......
Leap	......	......
Marquis	3,100	.1
Mediterranean	1,331,900	55.5
Nigger	......	......
Poole	300	......
Purplestraw	4,200	.2
Red May	7,000	.3
Resaca	......	......
Russian Red	15,000	.6
Sonora	2,400	.1
Turkey	813,200	33.9
Vernal (emmer)		
Walker	1,600	.1
Others and not reported	115,879	4.8
Total	2,401,379	100.0
UTAH (126).		
Big Club	100	......
Club (varieties not reported)	24,300	9.1

TABLE 2.—*Estimate of actual and percentage acreages of wheat varieties grown in the several States in 1919*—Continued.

State and variety.	Area grown.	
	Acres.	Per cent.
UTAH—continued.		
Defiance	2,500	0.9
Dicklow	3,500	1.3
Durum (varieties not reported)	100	......
Genesee Giant	1,600	.6
Goldcoin	22,700	8.5
Indian	....	......
Jones Fife	3,100	1.2
Kofod	7,900	2.9
Little Club	1,800	.7
Lofthouse	2,900	1.1
Martin	....	......
Marquis	15,600	5.8
Odessa	8,500	3.2
Pacific Bluestem	11,700	4.4
Red Fife	....	......
Sevier	900	.3
Silvercoin	1,600	.6
Sonora	8,100	3.0
Surprise	23,400	8.7
Touse	18,600	6.9
Turkey	83,300	31.0
Others and not reported	26,257	9.8
Total	268,457	100.0
VERMONT (32).		
Ghirka	200	1.8
Marquis	5,600	49.7
Red Fife	400	3.5
Others and not reported	5,076	45.0
Total	11,276	100.0
VIRGINIA (548).		
China	2,600	0.3
Currell	15,700	1.6
Dawson	800	.1
Diehl-Mediterranean	1,400	.1
Flint	41,500	4.2
Fulcaster	378,300	38.1
Fultz	103,800	10.5
Fultzo-Mediterranean	6,400	.6
Gipsy	1,700	.2
Goldcoin	700	.1
Jones Fife	200	......
Leap	226,600	22.7
Mammoth Red	....	......
Mediterranean	61,500	6.3
Poole	4,700	.5
Purplestraw	3,100	.3
Red May	1,700	.2
Red Wave	11,500	1.2
Rice	200	......
Rudy	1,200	.1
Russian Red	1,400	.1
Silversheaf	....	......
Turkey	1,100	.1
Others and not reported	126,161	12.7
Total	992,261	100.0
WASHINGTON (257).		
Allen	13,400	0.5
Arcadian	....	......
Baart	305,600	12.2
Big Club	3,700	.1
Black Winter (emmer)		
Club (varieties not reported)	112,500	4.5
Coppei	4,800	.2
Dale	....	......
Durum (varieties not reported)	1,300	.1
Goldcoin	225,500	9.0
Hybrid 63	15,600	.6
Hybrid 108	4,800	.2
WASHINGTON—continued.		
Hybrid 123	26,900	1.1
Hybrid 128	184,000	7.4
Hybrid 143	49,500	2.0
Jenkin	40,700	1.6
Jones Fife	215,900	8.7
Little Club	19,200	.8
Marquis	231,700	9.3
Martin	13,700	.5
Mayview		
Mexican Bluestem	....	......
Pacific Bluestem	620,500	24.9
Redchaff	13,600	.5
Red Russian	108,400	4.3
Schlanstedt		
Sol	800	......
Sonora	....	......
Squareheads Master	....	......
Surprise	....	......
Titanic		
Triplet		
Turkey	190,400	7.6
Winter Alaska		
Winter Bluestem		
Others and not reported	91,660	3.9
Total	2,494,160	100.0
WEST VIRGINIA (307).		
China	....	......
Climax	....	......
Currell	500	0.2
Dawson	300	.1
Democrat	....	......
Diehl-Mediterranean	2,100	.7
Durum (varieties not reported)	100	......
Flint	400	.1
Fulcaster	86,800	29.1
Fultz	47,900	16.1
Fultzo-Mediterranean	14,100	4.7
Gipsy	100	......
Goldcoin	1,000	.3
Harvest Queen	100	......
Jones Fife	500	.2
Leap	9,300	3.1
Marquis	200	.1
Mealy	100	......
Mediterranean	31,400	10.5
Nigger	100	......
Poole	39,000	13.1
Prosperity	1,400	.5
Red Clawson	1,900	.6
Red May	1,500	.5
Red Wave	17,800	.6
Rice	1,000	.3
Rudy	500	.2
Russian Red	100	......
Silversheaf	10,400	3.5
Turkey	....	......
White Wonder	200	.1
Others not reported	29,236	15.4
Total	298,036	100.0
WISCONSIN (590).		
Bacska	900	.2
Dawson	1,400	.3
Dixon	....	......
Durum (varieties not reported)	12,100	2.3
Fultz	2,100	.4
Goldcoin	400	.1
Haynes Bluestem	40,600	7.7
Humpback	1,600	.3
Iowa No. 404	100	......
Java	....	......
Marquis	313,400	59.2
Odessa	200	......

TABLE 2.—*Estimate of actual and percentage acreages of wheat varieties grown in the several States in 1919*—Continued.

State and variety.	Area grown.		State and variety.	Area grown.	
	Acres.	Per cent.		Acres.	Per cent.
WISCONSIN—continued.			WYOMING—continued.		
Prelude	2,700	0.5	Durum (varieties not reported)	42,500	24.0
Preston	26,800	5.1	Erivan		
Red Clawson	900	.2	Ghirka		
Red Fife	13,300	2.5	Goldcoin		
Red May	3,500	.7	Haynes Bluestem	4,900	2.8
Red Wave	600	.1	John Brown		
Turkey	39,600	7.5	Jones Fife		
Wisconsin Pedigree No. 2	6,900	1.3	Kubanka		
Others not reported	62,645	11.6	Ladoga	3,400	1.9
			Marquis	61,100	34.5
Total	529,745	100.0	Odessa	100	
			Peliss	500	.3
WYOMING (105).			Preston	1,300	.7
			Red Fife	2,100	1.2
Acme			Regenerated Defiance		
Alton			Sonora		
Arnautka			Surprise	400	.2
Black Winter (emmer)			Touse	100	
Buffum No. 17			Turkey	27,800	15.7
Champlain	1,200	.7	Vernal (emmer)		
Club (varieties not reported)	1,600	.9	White Polish		
Converse			Others and not reported	25,967	14.8
Defiance	3,300	1.9			
Dicklow	700	.4	Total	176,967	100.0

TABLE 3.—*Estimated actual and percentage acreages of wheat varieties as shown by 18,539 reports for the entire United States.*

Variety.	Area grown.		Variety.	Area grown.	
	Acres.	Per cent.		Acres.	Per cent.
Acme			Dart		
Alaska	600	......	Dawson	125,500	0.17
Allen	15,200	0.02	Defiance	194,400	.27
Alstroum (spelt)			Democrat	6,100	.01
Alton	8,100	.01	Diamond Grit		
Arcadian			Dicklow	164,600	.23
Ariette			Diehl-Mediterranean	114,700	.16
Arnautka	14,400	.02	Dixon	......	......
Ashland			Durum (varieties not reported)	4,201,400	5.77
Baart	500,500	.69	Early Defiance		
Bacska	900	......	Early Red Fife		
Bearded (spelt)			Eaton	9,500	.01
Bearded Winter Fife			Einkorn		
Beloglina			Emerald		
Big Club	21,700	.03	Erivan		
Big Frame	......	......	Federation		
Blackhull	......	......	Fleming	......	......
Black Winter (emmer)			Flint	97,200	.13
Bluechaff	......	......	Foisy	41,300	.06
Bobs			Fretes	1,700	......
Buffum No. 17	......	......	Fulcaster	2,576,500	3.54
Buford			Fultz	4,801,100	6.59
Bunyip	......	......	Fultzo-Mediterranean	287,900	.40
Canadian Red	300	......	Galgalos	34,500	.05
Challenge			Genesee Giant	1,600	......
Champlain	4,300	.01	Ghirka	800	......
China	63,900	.09	Gipsy	122,500	.17
Chul	1,900	......	Gladden	7,700	.01
Clackamas			Gluten		
Climax	16,800	.02	Glyndon	2,000	......
Club (varieties not reported)	481,700	.66	Goens	132,600	.18
Colorado No. 50	3,300	......	Goldcoin	947,100	1.30
Converse	4,300	.01	Gold Drop	1,600	......
Coppei	4,800	.01	Golden Ball		
Cox	1,000	......	Golden Cross	900	......
Currell	645,000	.89	Grandprize	34,100	.05
Dakota			Greeson	5,100	.01
Dale	2,200	......	Gypsum	9,600	.01

TABLE 3.—*Estimated actual and percentage acreage of wheat varieties as shown by 18,539 reports for the entire United States*—Continued.

Variety.	Area grown.		Variety.	Area grown.	
	Acres.	Per cent.		Acres.	Per cent.
Hard Federation			Preston	2,233,200	3.06
Harvest Queen	1,007,600	1.38	Pride of Genesee	2,400	......
Haynes Bluestem	1,530,800	2.10	Prohibition	24,600	.03
Homer	....	......	Propo	19,400	.03
Honor			Prosperity	46,000	.06
Humpback	31,900	.04	Purplestraw	273,800	.38
Huron			Quality		
Hussar			Read	....	......
Huston	22,400	.03	Red Bobs		
Hybrid 60			Redchaff	40,000	.05
Hybrid 63	33,200	.05	Red Chief		
Hybrid 108	4,800	.01	Red Clawson	80,900	.11
Hybrid 123	28,100	.04	Red Fife	750,000	1.03
Hybrid 128	259,900	.36	Red May	1,165,900	1.60
Hybrid 143	49,500	.07	Red Rock	216,000	.30
Illini Chief	21,300	.03	Red Russian	154,900	.22
Imperial Amber			Red Wave	1,132,400	1.55
Indian	200	......	Red Winter (spelt)		
Iowa No. 404	14,100	.02	Regenerated Defiance	....	......
Iowa No. 1946			Resaca	2,400	......
Java	55,000	.08	Rice	30,900	.04
Jenkin	66,500	.09	Rink	14,400	.02
John Brown			Rochester	900	......
Jones Fife	476,100	.65	Ruby		
Jumbuck			Ruddy		
Kahla	19,500	.03	Rudy	399,400	.55
Kanred	97,500	.13	Rupert	14,200	.02
Khapli (emmer)			Rural New Yorker No. 6		
Kinney	23,400	.03	Rural New Yorker No. 57		
Kitchener			Russian		
Kofod	7,900	.01	Russian Red	172,000	.24
Kota			Rysting		
Kubanka	52,300	.07	Satisfaction		
Kubanka No. 8			Schlandstedt		
Ladoga	20,800	.03	Schonacher	1,000	......
Laramie			Seneca Chief		
Leap	513,100	.70	Sevier	900	......
Link			Sibley	200	......
Little Club	106,100	.15	Silvercoin	1,600	......
Lofthouse	6,500	.01	Silversheaf	34,900	.05
Longberry No. 1	4,600	.01	Sol	800	......
Lynn	9,300	.01	Sonora	243,900	.33
Mammoth Amber			Squarehead		
Mammoth Red	3,600	......	Squareheads Master		
Marouani			Stanley		
Marquis	11,825,200	16.24	Surprise	60,900	.08
Martin	37,800	.05	Talimka		
Mayview			Titanic		
Mealy	65,500	.09	Touse	20,200	.03
Mediterranean	2,558,900	3.51	Treadwell		
Mexican Bluestem	....	......	Triplet		
Mindum			Trumbull	1,900	
Minhardi			Turkey	21,588,300	29.65
Minturki			Valley	5,200	.01
Monad			Velvet Don	600	
Montana No. 36	100	......	Vernal (emmer)		
Nebraska No. 28			Virginia		
Nebraska No. 60			Walker	24,300	.03
New Amber Longberry			Wellman		
New Zealand	....	......	Wheedling	10,900	.01
Nigger	280,600	.39	White Federation		
Norka			White Fife	2,400	
Oakley	1,500	......	White Polish	200	
Oatka Chief			White Spring (spelt)		
Odessa	54,200	.07	White Winter	52,700	.07
Ontario Wonder			White Wonder	700	......
Pacific Bluestem	1,363,400	1.87	Wilbur	6,700	.01
Palisade	41,500	.06	Windsor	100	......
Peliss	1,900	......	Winter Alaska		
Penquite	12,200	.02	Winter Bluestem		
Pentad	50,800	.07	Winter Chief		
Pesterboden			Wisconsin Pedigree No. 2	6,900	.01
Peterson	....	......	Wisconsin Pedigree No. 40		
Pilcraw	....	......	Wyandotte	700	......
Pioneer			Yaroslav		
Poole	2,453,400	3.37	Zimmerman	12,600	.02
Portage	4,500	.01	Others and not reported	4,977,100	6.84
Power	9,100	.01			
Prelude	2,700	......	Total	72,801,614	100.0

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Name.	Page.
Abundance	101
ACME	184, 186
Acme	136, 167
Acme Bred	136
Advance	106
Alabama Bluestem	88
ALASKA	181, 182
Alberta Red	145
ALLEN	53, 103
ALSTROUM (spelt)	196
ALTON	53, 89
Amber	58
American Banner	101
American Bronze	79
Anti-Rust	153
ARCADIAN	53, 99
Argentine	145
ARIETTE	57, 166
Arizona Baart	131
Arizona No. 39	71
Armstrong	58
ARNAUTKA	184, 187
ASHLAND	53, 85
Auburn	160
Aulieata	157, 166
Australian	66, 155
Australian Club	68, 81, 110
BAART	55, 131
BACSKA	56, 149
Baldwin	163
Bastard	165
Bay	68
Bearded Bluestem	136, 171
Bearded Fife	150
Bearded Purplestraw	136
BEARDED (spelt)	196, 197
BEARDED WINTER FIFE	57, 168
Beechwood	112, 116
Beechwood Hybrid	112
Belgian rye	198
BELOGLINA	56, 149
Beloturka	189
Ber Ban	84
Bernard Fife	92
BIG CLUB	173, 175
Big English	81
Big Four	160, 175
BIG FRAME	52, 74
Big Ten	160
Bishop's Pride	60
Black-Bearded durum	186
Black Chaff	144
Black Don	192
Black Durum	192
Black Emmett	192
BLACKHULL	56, 143
Black Mediterranean	153
Black Sea	78
Black Swamp	192
Black Tea	141
BLACK WINTER (emmer)	194, 195
Blankenship	136
Blount's Lambrigg	67
BLUECHAFF	173, 178
Blue Chaff Calvert Club	179
Blue Ribbon	150
Blue Ridge	136, 160
Bluestem	66, 84, 88, 112, 115, 125, 136, 167
Bluestem Fultz	84
BOBS	52, 69
Bolton Bluestem	125
Boughton	116, 205
Brown Squarehead	110
Budapest	143
Buffum's Improved Winter emmer	195
BUFFUM NO. 17	52, 75

Name. Page.
BUFORD, 184, 190
Bulgarian, 89, 145
Bull Moose, 128
BUNYIP, 51, 64
Burbank's Super, 123
Burrhead, 86
Burtaker, 109
California Club, 68
California Gem, 68
California Red, 112
Canada Club, 63, 205
Canadian, 78, 136
Canadian Fife, 78, 92
Canadian Hybrid, 116, 123
CANADIAN RED, 57, 158
Canadian Spring, 159
Castillione, 205
Celebrated K. B. No. 2, 97
CHALLENGE, 51, 60
Champion, 136
CHAMPLAIN, 56, 139
Chile, 66
Chile Club, 175
CHINA, 54, 114
China Tea, 141
CHUL, 56, 156
CLACKAMAS, 181
Clackamas Wonder, 181
Clanfield, 81
Clark's Black Hulled, 143
Clawson, 101, 118
CLIMAX, 53, 97
Climax, 150
Clipperd's Bearded, 155
Club, 86
Club Head, 86
Coffee, 155
COLORADO NO. 50, 51, 62
Colorado Special, 67
Columbia, 86, 131
CONVERSE, 56, 142
COPPEI, 173, 179
Corn, 136
Corn wheat, 198
COX, 57, 163
Cox Red Crown, 164
Crail Fife, 123
Crimean, 145
Crookneck Club, 175
Cumberland Valley, 136
Cummings, 163
CURRELL, 54, 110
Currell's Prolific, 110
DAKOTA, 55, 126
DALE, 173, 179
Dale Gloria, 179
DART, 52, 66
Dart's Imperial, 66
Davidson, 162
Davis, 155
DAWSON, 53, 98
Dawson Golden Chaff, 98
DEFIANCE, 51, 63
Defiance, 134, 145

Name. Page.
DEMOCRAT, 55, 128
D-1, 187
D-5, 185
D-fife, 185
DIAMOND GRIT, 56, 139
DICKLOW, 52, 68
DIEHL-MEDITERRANEAN, 57, 160
Diener Hybrids, 131
Diener No. 18, 131
Dietz, 136
Dietz Longberry, 136
Dietz Longberry Red, 136
DIXON, 56, 156
Double Head, 86
Duck Bill, 86
Dunlap, 163
Dunlop, 163
Dutch, 79
Early Arcadian, 99
Early Baart, 131
Early Carlyle, 118
EARLY DEFIANCE, 51, 62
Early Genesee Giant, 157
Early Harvest, 116
Early Iowa, 141
Early Java, 140, 141
Early Jowa, 141
Early May, 83, 116
Early Oakley, 82
Early Ontario, 86
Early Purplestraw, 88
Early Red Chief, 119
Early Red Clawson, 118
EARLY RED FIFE, 53, 95
Early Rice, 73
Early Ripe, 116
Early Rudy, 153
Early Russian, 96
Early Spring, 157
Early Sunrise, 81
Early White Leader, 207
Early Wilbur, 180
Early Wonder, 89, 207
EATON, 51, 61
Ebersole, 136
Eclipse, 160
Economy, 84, 86
Eden, 136
Egyptian, 134, 145, 182
Egyptian Amber, 136
EINKORN, 199
Eversole, 136
Eldorado, 101, 182
EMERALD, 56, 157
English Squarehead, 81
Enterprise, 116
ERIVAN, 56, 141
Everitt's High Grade, 84
Excelsior, 68
Extra Early Oakley, 82
Extra Early Windsor, 100
Famine, 136
Farmers Friend, 134, 136
Farmers Pride, 86

Name. Page.
Farmers Trust 158, 162, 167
FEDERATION 54, 103
Fife 92, 123
Finley 118
Fishhead 123
Flat Top 86
FLEMING 54, 106
FLINT 53, 82
FOISY 54, 103
Fortyfold 101
Forty-to-One 136
FORWARD 52, 80
Four-Row Fultz 86
FRETES 56, 155
FULCASTER 56, 135
FULTZ 53, 83
FULTZO-MEDITERRANEAN 53, 85
GALGALOS 55, 126
Genesee 158
GENESEE GIANT 57, 157
Georgia Bluestem 88
Georgia Red 88, 136
German Amber 134
German Red 81
German rye 198
Gharnovka 189
GHIRKA 53, 95
Ghirka Spring 95
Ghirka Winter 89
Giant rye 198
Giant Squarehead 158
Gill 111, 112
GIPSY 55, 133
Gipsy Queen 134
GLADDEN 55, 133
GLUTEN 56, 154
Gluten B 86 154
GLYNDON 53, 93
GOENS 57, 162
Going 163
Gold Bullion 101
GOLDCOIN 53, 100
GOLD DROP 54, 105
GOLDEN BALL 185, 191
Golden Bronze 99
Golden Chaff 99, 101, 111, 128, 136
GOLDEN CROSS 56, 139
Golden Cross 158
Golden Drop 105, 150
Golden Gate Club 68
Golden King 136
Golden Straw 134
Gold Medal 101, 109
Goldmine 101
Goose 136, 188, 198
Grains o' Gold 84, 134
GRANDPRIZE 55, 127
Grass 89, 107
Great Western 167
Grecian 97
Greening 136
Greensboro 60
GREESON 51, 60
GYPSUM 52, 67

Name. Page.
Half Bushel 136
Hall 163
Halver 84
Hansen 121
HARD FEDERATION 54, 104
Hard Winter 145
Harper 86
Hartzel 109
Harvest King 112
HARVEST QUEEN 52, 77
Haskell 109
Hastings Prolific 76
HAYNES BLUESTEM 55, 124
Hedge Prolific 112
Herman Fife 92
Hickman 84
High Grade 84
HOMER 54, 105
HONOR 53, 99
HUMPBACK 57, 171
Humpback II 156
Hundred-and-One 145
Hundred Mark 79, 112
Hungarian 143, 145
HURON 57, 164
HUSSAR 56, 142
HUSTON 53, 88
Hybrid Mediterranean 160
HYBRID 60 173, 176
HYBRID 63 173, 176
HYBRID 108 173, 177
HYBRID 123 173, 177
HYBRID 128 173
HYBRID 143 173, 176
Hydro Prolific 112
Idaho Hard 157
ILLINI CHIEF 54, 117
IMPERIAL AMBER 57, 162
Imperial Club 68
Imported Scotch 78
Improved Acme 136
Improved Amber 99
Improved English 84
Improved Fultz 84
Improved No. 6 101
Improved Turkey 145
INDIAN 55, 121
Indiana Red Wave 106
Indiana Swamp 134
International No. 6 101
International No. 8 79
Invincible 79
IOWA No. 404 56, 147
IOWA No. 1946 56, 147
Ironclad 136
Italian Wonder 78
Japanese Velvet Chaff 172
JAVA 56, 140
JENKIN 173, 178
Jenkin's Club 178
Jersey Fultz 84
Jerusalem 182
Jerusalem rye 198
Jim Holly 69

Name. Page.
JOHN BROWN 53, 102
Johnson 150, 156, 188
Johnson's Early Fife 150
Jones Climax 97
JONES FIFE 55, 123
Jones Longberry 116
Jones Longberry No. 1 159
Jones Mammoth Amber 129
Jones Red Wave 106
Jones Silver Sheaf Longberry Red 155
Jones Winter Fife 123
JUMBUCK 55, 121
Junior No. 6 101
KAHLA 185, 192
KANRED 56, 148
K. B. No. 2 97
Kansas Queen 78
Kansas Mortgage Lifter 136
Kathiawar 194
Kentucky Bluestem 112
Kentucky Giant 136, 153
Kentucky Wonder 136
Key's Prolific 167
KHAPLI (emmer) 194
Kharkof 145
KINNEY 53, 87
KITCHENER 53, 96
Kivet 205
Klondike 101
Koffoid 98
KOFOD 53, 98
KOTA 56, 152
KUBANKA 184, 189
KUBANKA No. 8 184, 190
Ladd Durum 185
LADOGA 57, 165
Lancaster 136
Lancaster-Fulcaster 136
Lancaster Red 167
Landreth 58
LARAMIE 57, 165
Lars Peterson 106
LEAP 52, 75
Leap's Prolific 75
Lebanon 134
Lebanon Valley 115
Lehigh 167
Lincoln 136
LINK 56, 157
LITTLE CLUB 173, 174
Little May 83
Little Red 83, 89
Little Red May 83
Little Red Jersey 84
Littleton 105
LOFTHOUSE 52, 74
LONGBERRY No. 1 57, 159
Lost Freight 145
Lost Nation 205
LYNN 52, 71
Lynn Rust Proof 71
Malakof 145
Malcome 145
MAMMOTH AMBER 55, 129
Name. Page.
MAMMOTH RED 56, 138
Many Headed 182
Many Spiked 182
MAROUANI 184, 190
MARQUIS 53, 90
Martha Washington 136
MARTIN 51, 58
Martin Amber 58
Marvel Bluestem 125
Marvelous 136
May 83, 116
May Queen 78
MAYVIEW 173, 180
McKendry Fife 92
McKennon 84
McKissick Fife 92
MEALY 55, 122
MEDITERRANEAN 57, 166
MEXICAN BLUESTEM 51, 66
Michigan Amber 116
Michigan Bronze 160
Michigan Brown 160
Michigan Red 79
Michigan Red Line 136
Michigan Wonder 116
Millennium 136
Millennium Dawn 136
Miller 167
Miller's Choice 160
Miller's Pride 163, 167
MINDUM 184, 188
MINHARDI 52, 73
Minnesota No. 163 94
Minnesota No. 169 125
Minnesota No. 188 150
Minnesota No. 1505 74
Minnesota No. 1507 142
Minnesota Red Cross 145
Minnesota Reliable 145
Minnesota Wonder 205
MINTURKI 56, 142
Miracle 136, 182
Missing Link 157
Missouri Bluestem 167
MONAD 184, 187
Montana Deal 81
MONTANA No. 36 56, 148
Montezuma Club 175
Moore's Prolific 136
Mortgage Lifter 112, 115, 167, 182
Mountain Purplestraw 88
Multiple Headed 182
Multiplier 136
Multiplying 136
Mummy 182
Nebraska Hybrid 133
NEBRASKA NO. 28 55, 132
NEBRASKA NO. 60 56, 148
Neverfail 82
NEW AMBER LONGBERRY 57, 159
New American Banner 101
New Columbia 86
New Economy 84
New Genesee 128
New Light 136

Name.	Page.
New Marvel or Goose	136
New 100	78
New Soules	101
NEW ZEALAND	52, 72
Niagara	101, 134
Nicaragua	188
NIGGER	56, 154
Ninety-Day	72, 89, 127
Nissley	112
Nissley's Hybird	112
Nixon	84
Noah Island	87
No Name	79
NORKA	57, 164
North Dakota No. 316	126
Norwood	82
Number 6	101, 109
Number 8	79
Number 10	136
OAKLEY	53, 82
OATKA CHIEF	55, 128
Ocean Wave	112
ODESSA	54, 107
Odessa	87
Old Dutch	106
ONTARIO WONDER	52, 76
Orange	116
Oregon Club	175
Oregon Golden Chaff	104
Oregon Goldmine	101
Oregon Red	78
Oregon Red Chaff	104, 112, 178
Oregon White	60
Owen	163
PACIFIC BLUESTEM	51, 65
PALISADE	55, 129
Palouse Bluestem	66
Pearl Prolific	111
Peck	136
Pedigree Giant	158
PELISS	184, 186
Pelissier	186
Pennsylvania Bluestem	115
Pennsylvania Standard	97
PENQUITE	57, 171
Penquite's Velvet Chaff	171
PENTAD	184, 185
Perfection	111
Pererodka	189
Perpetuated Fultz	84
PESTERBODEN	56, 143
PETERSON	54, 106
Pierson	188
PILCRAW	52, 72
Pilcraw Enormous	72
Pillsbury Fife	92
PIONEER	56, 152
Pioneer Turkey	145
Plymouth Rock	101
Polish	197–198
POOLE	54, 112
PORTAGE	54, 113
POWER	53, 93
Power's Fife	93
Prairie Queen	78
PRELUDE	57, 170
PRESTON	56, 150
Prettybone	111
Price's Wonder	136
Pride of California	68
Pride of Indiana	116
PRIDE OF GENESEE	57, 169
Pride of Oregon	71
Pride of the Valley	119
Pringle's Champion	140
Pringle's Champlain	139
Pringle's Defiance	63
Pringle's Surprise	67
Prizetaker	78, 101
Prizewinner	101
Prohi	59
PROHIBITION	51, 59
Prolific	111
Proper	130
PROPO	55, 130
PROSPERITY	52, 79
Purple Durum	192
PURPLESTRAW	53, 87
P-762	149
P-1066	149
P-1068	149
QUALITY	52, 69
Queen of New York	153
Rappahannock	83, 117
Rattle Jack	160
R. B. R. 3	152
READ	57, 168
Read's Vermont Winter	168
Red Allen	103
Red Amber	112, 116
RED BOBS	53, 89
Red or California	112
REDCHAFF	173, 178
Red Chaff	104, 106, 112, 127, 163, 167
Red Chaff Bearded	163
Red Chaff Club	178
Redchaff Red Russian	110
RED CHIEF	54, 119
RED CLAWSON	54, 118
Red Cross	78, 116
Red Davie	83
Red Durum	185
RED FIFE	53, 92
Red Fife	150
Red Fultz	112
Red Hall	163
Red Haskell	109
Red Hassel	109
Red Hussar	109, 142
Red Hybrid	177
Red Ivory	106
Red King	112
RED MAY	54, 115
Red May	83
Red Odessa	111
Red Prolific	111
Red Republic	116
Red Resaca	120
Red Rice	73
RED ROCK	57, 168

Name. Page.
Red Russell 112
RED RUSSIAN 52, 81
Red Russian 114, 142, 145
Red Sea 167
Red Spring 89
Red Swamp 192
Red Top 167
Red Victory 79
Red Wafer 106
Red Walla 81, 177
RED WAVE 54, 105
Red Winter 145
RED WINTER (spelt) 196, 197
Red Wonder 136
Reed 182
REGENERATED DEFIANCE 52, 72
Reliable 134
Republican Red 116
RESACA 54, 120
Resistant Fife 185
RICE 52, 73
Rice wheat 198
Rickenbrode 59
Rimpau's Red Schlanstedter Sommerweizen 119
RINK 51, 64
Rio Grande 205
Ripley 88
ROCHESTER 54, 119
Rochester No. 6 101
Rochester Red 119
Rocky Mountain 167
Romanella 145
Roosevelt 84
Royal Red Clawson 112
Ruble 106
RUBY 53, 96
Ruby 72
Ruck 109
RUDDY 54, 108
RUDY 56, 153
RUPERT 54, 108
Rupert's Giant 108
RURAL NEW YORKER NO. 6 54, 109
RURAL NEW YORKER NO. 57 57, 169
Russellite 136
Russell's Wonder 136
RUSSIAN 57, 161
Russian 96, 145
Russian Amber 134, 160
Russian Club 106
Russian Fife 96
RUSSIAN RED 54, 113
Russian Red 126
Rust Proof 84, 106, 134, 185
RYSTING 53, 94
Rysting's Fife 94
St. Louis Grand Prize 127
Salt Lake Club 175
Salzer's Prizetaker 78
Saskatchewan Fife 92, 95
SATISFACTION 51, 61
Satisfaction 58
Saumur 132
SCHLANSTEDT 54, 119
SCHONACHER 53, 99

Name. Page.
Scotch Fife 92
Scott's Squarehead 86
Sea Island 205
Select Bluestem 126
SENECA CHIEF 55, 128
Seven Headed 182
Seven Headed Sinner 182
SEVIER 57, 159
Shamrock 84
Shelby Red Chaff 163
Shepherd's Perfection 160
Shepherd's Prolific 160
Shepherd's Tennessee Fultz 119
Shot Club 176
Siberian 141
Siberian Cow 198
SIBLEY 56, 135
Sibley New Golden 135
Silver Chaff 58, 68, 79
Silver Club 68
SILVERCOIN 54, 120
Silver King 123
SILVERSHEAF 56, 155
Slickhead 84
Sloat 192
Small Club 175
Smith Club 68
Smith's Rust Proof 61
Smooth Humpback 156
Smyrna 182
SOL 52, 81
SONORA 55, 126
Soules 101
Spade 160
"Speltz" 195
Spring Turkey 165
SQUAREHEAD 52, 80
Squarehead 81
Square Head 86
SQUAREHEADS MASTER 54, 110
Square Top 86
Standby 167
STANLEY 54, 120
Station No. 66 93
Stoner 136
Stooling 136
Stub Head 86
Sun 82
Super 123
Superlative 101
SURPRISE 52, 67
Surprise 87
Swamp 89, 167
Swedish 141
Sweet Water Valley 112
Syrian 182
Taganrog 189
TALIMKA 55, 132
Taos 182
Tappahannock 116, 205
Tauranian 145
Tea Leaf 141
Tennessee Fultz 84
Tennessee Prolific 111
Theiss 145
Three Peck 136

Name. Page.

- Tipton Red 84
- TITANIC 181, 182
- Torgova 143
- TOUSE 51, 62
- TREADWELL 55, 130
- TRIPLET 55, 121
- *Triticum*[32] 50
  - *aestivum* 50
  - *compactum* 50, 51
    - *cretisum* 173
    - *erinaceum* 173
    - *humboldtii* 173
    - *rufulum* 173
    - *wernerianum* 173
    - *wittmackianum* 173
  - *dicoccum* 50
    - *atratum* 194
    - *farrum* 194
  - *durum* 50
    - *affine* 184
    - *hordeiforme* 184
    - *leucomelan* 184
    - *melanopus* 185
    - *taganrogense* 185
  - *monococcum* 50
    - *vulgare* 199
  - *polonicum* 50
    - *levissimum* 198
  - *sativum* 50
  - *spelta* 50
    - *album* 196
    - *arduinii* 196
    - *rufum* 196
  - *turgidum* 50
    - *jodurum* 181
    - *linnaeanum* 181
    - *mirabile* 181
  - *vulgare* 50
    - *albidum* 51
    - *alborubrum* 53
    - *barbarossa* 57
    - *delfii* 55
    - *erythroleucon* 56
    - *erythrospermum* 55
    - *ferrugineum* 57
    - *graecum* 55
    - *leucospermum* 54
    - *lutescens* 52
    - *meridionale* 57
    - *miltura* 54
    - *pyrothrix* 55
    - *velutinum* 57
    - *villosum* 55
- TRUMBULL 53, 85
- TURKEY 56, 144
- Turkey Red 144, 145
- Turkish Amber 136
- Turkish Red 145
- Tuscan Island 136
- Twentieth Century 79, 101, 109

Name. Page.

- Two Peck 136
- Ulta 145
- University Gem 68
- VALLEY 56, 134
- Velvet Bluestem 125
- Velvet Chaff 122, 123, 126, 150, 169, 172
- VELVET DON 185, 191
- Velvet Head 122, 128
- Verdon Fife 92
- VERNAL (emmer) 194
- VIRGINIA 57, 170
- Virginia Reel 78
- Wagner 112
- Waif 106
- WALKER 52, 77
- Washington Hybrid No. 128 174
- Waverly 106
- Webb's Challenge White 60
- Weissenburg 143
- WELLMAN 53, 94
- Wellman's Fife 94
- Wheat of Miracle 182
- Wheat 3,000 Years Old 182
- WHEEDLING 54, 115
- White Amber 58
- White Australian 66
- White Bluestem 66
- White Century 101
- White Chile 66
- White Clawson 101
- White Columbia 131
- White Eldorado 101
- White Elliott 66
- WHITE FEDERATION 52, 71
- WHITE FIFE 52, 70
- White Hybrid 174, 176, 177
- White Lammas 66
- White Leader 205
- White Oregon 129
- White Palisade 129
- WHITE POLISH 198
- White Rice 73
- White Rock 101
- White Russian 68, 95, 101
- White Sonora 127
- White Soules 101
- White Spring 129
- White Spring (emmer) 194
- WHITE SPRING (spelt) 196
- White Surprise 101
- White Touse 63
- White Velvet Chaff 122
- WHITE WINTER 51, 60
- White Winter 99
- WHITE WONDER 51, 61
- WILBUR 173, 180
- Wilcox Fife 92
- Wild Goose 182, 188, 198
- Wilson 97

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[32] The Latin names are indexed here for the convenience of those familiar with the classifications of Alefeld, Koernicke and Werner, and others, and not as representing the conclusions of the writers.

Name. Page.
Wilson Special 97
WINDSOR 53, 100
WINTER ALASKA 181, 183
WINTER BLUESTEM 51, 58
WINTER CHIEF 54, 111
Winter Club 106
Winter Fife 123
Winter Green 154
Winter John 154
Winter King 101, 112, 136, 154
Winter La Salle 74
Winter Nellis 74
Winter Pearl 84
Winter Queen 78
Winter Saskatchewan 139
Wisconsin No. 18 145
WISCONSIN PEDIGREE No. 2 56, 148
WISCONSIN PEDIGREE No. 40 56, 135
Name. Page.
Wisconsin Pedigree No. 408 149
Wisconsin Wonder 171
Wold's White Winter 60
Wolf Hybrid 103
Wonderful 136
Woods 109
Woods Prolific 76
Woolf 76
World Beater 171
Worlds Champion 145
Worlds Fair 106
WYANDOTTE 53, 82
Wyandotte Red 82
Yantagbay 157
YAROSLAV 57, 164
Yaroslav (emmer) 195
Yellow Gharnovka 189
Zeller's Valley 118
ZIMMERMAN 52, 76
Zinn's Golden 79

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